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ORIGINAL ARTICLES.

THE ETIOLOGY AND CHEMICAL PATHOLOGY OF GALL-STONES.*

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ALTHOUGH the methods of modern surgery have perhaps robbed gall-stones of some part of their medical interest by lessening their menace to life and by doing much to prevent their recurrence, gall-stone pathology remains a fascinating field for the experimentalist and is not wholly without promise for the student of preventive medicine and therapeutics. It is the purpose of this paper to deal with our present knowledge of the conditions that attend the production of human gall-stones, and, pointing out some gaps in this knowledge, to suggest problems for further research.

The well-known variety in gall-stones, as regards their chemical constitution and the arrangement of material within the concretions is in itself an indication that the conditions of stone-formation are not always the same. Thus the cholesterin stone, consisting almost wholly of cholesterin, disposed in radial crystals about a small débris center, speaks for a very different developmental history from that of the bilirubin-calcium stone containing little or no cholesterin. In the following pages some explanation will be offered for these varieties in chemical constitution.

Origin of the Chief Constituents of Gall-stones.—Since cholesterin and bilirubincalcium are by far the most abundant and regular constituents of gall-stones, it is desirable to consider their origin and the conditions attending their appearance as constituents of calculi.

1. *Cholesterin.*†—This monatomic occurs in bile from human fistulæ in only low percentage.‡ In bladder bile the percentage is somewhat higher.§ The greater proportion observed in the cystic bile can almost certainly be attributed in part to cholesterin derived from epithelial cells lining the gall-bladder and not to a concentration of the bile from absorption of water.

Of the origin of the cholesterin of the hepatic bile little is known. A part is probably obtained from the blood and it is likely that diseases attended by a considerable increase in the cholesterin of the blood (as in some cases of diabetes) lead to the passage of an excessive quantity of the compound into the bile, but it must be admitted that there is no convincing evidence on this point. There also remains much to be learned as to the origin of the cholesterin found in normal blood. We know that this substance can be obtained from columnar or cuboidal epithelial cells and that it occurs in the central nervous system. Probably it is a normal cleavage product of larger molecules, but its biological significance is still obscure.

When cholesterin is found either in the crystalline or amorphous state in larger or smaller concretions on the floor of the human gall-bladder it is commonly assumed that this cholesterin has been precipitated from a bile that is over saturated. In many instances this is doubtless a correct view, but I think it can be shown that many small masses of cholesterin arise in a wholly different way through the aggregation of very small globules of intra-epithelial material. From the gall-bladders of patients dying of chronic nephritis and other chronic diseases, are sometimes freed numerous small, dark, friable masses of less than pinhead size, which lie in the dependent parts of the bladder. On examining these masses with the microscope they are seen to consist of epithelial elements which have become highly granular and have lost their normal structure through degenerative alterations. This epithelial débris is commonly stained with bile pigment. It does not contain cholesterin crystals. Nevertheless when a drop of concentrated sulphuric acid is added to some of this material it gives a characteristic and marked reaction for cholesterin. The amorphous finely divided cholesterin which gives this reaction cannot reasonably be regarded as a precipitate from the bile but it is much more likely to be the direct derivative of epithelial cholesterin. The fact that the bile often contains an excess of cholesterin under these conditions is not opposed to this view, for one would expect that the bile would take up the cholesterin of epithelial origin until it has become quite saturated, after which there would be a liability to crystalline separation at any time.

It is probably true that cholesterin is sometimes separated from a saturated biliary solution owing to some alteration in the composition of the cystic bile which renders the lipoid material less soluble, but it is unlikely that such alterations in the solvent powers of the bile play an important part in the genesis of calculi. The solvent

*Read before the Congress of Physicians and Surgeons, May 13, 1903.

†Outline of Ritter's Method for Estimation of Cholesterin in Bile: Weighed amount bile is evaporated to dryness on H bath —and sodium alcoholate added. The whole is kept at a gentle boil on H_2O bath for two to three hours—then alcohol evaporated off. The residue is taken up in H_2O—c.p. NaCl added, then evaporated. The thoroughly dried residue is placed in filter cap and extracted with pure dry ether in Soxhlet's extractor for nine hours. The ethereal extract is filtered, ether removed, and the residue, composed of cholesterin, is weighed. To purify, dissolve residue in a little hot alcohol, and add H_2O to the solution in small quantities at a time. Cholesterin separates out, and may be filtered, dried and weighed.

‡Copeman and Winston found .099 per cent., Mayo Robson .045 per cent., Noël Paton and Balfour .062 per cent.

§Observations made by Dr. Baldwin in my laboratory indicate that the cholesterin content of human cystic bile is commonly about .1 per cent.

action of the bile for cholesterin depends in some degree on the biliary soaps and fats and especially on the bile-salts. A certain degree of alkalescence to litmus such as prevails in normal bile (human and canine) is favorable to this solution. There is no definite knowledge of any metabolic peculiarity or anomaly in man which leads to a diminished secretion of biliary salts.* Nor do we know of significant changes in the concentration of the soaps and fats. The reaction of the cystic bile in this connection deserves more attention than it has received but the opportunities of studying it in fresh human bile are necessarily very limited.

It is claimed by some writers that acid-producing bacteria give rise to an acid reaction of the bile.† There is, however, no satisfactory evidence that this occurs. The bile contains no appreciable reducing substances‡ and probably no fermentable carbohydrates. We know also that one organism, the typhoid bacillus, may be the sole excitant of gall-stones containing cholesterin although it is not an acid producer in ordinary media. Whether the cystic bile ever has an acid reaction in consequence of a diathetic acid intoxication cannot be positively stated but there are facts that render this most unlikely. Hence it may be said that although an acid bile is favorable to the separation of cholesterin there is no evidence at present to justify us in believing that pronounced acidification of the bile is essential to the formation of cholesterin gall-stones.

Excessive Cholesterin Production is the Chief Factor in the Production of Cholesterin Concretions.—The view that the cholesterin of gall-stones arises from the mucous membrane of the gall-bladder is not new. Budd suggested it in 1845, Bristowe revived it in 1887 and Naunyn became its earnest advocate in 1892. The facts that have appeared to speak most strongly for the local origin of cholesterin are two. First is the observation that epithelial cells desquamated from the mucous membrane of the gall-bladder soon undergo degenerative alterations attended with the production of new cholesterin, which in time may take on a crystalline form. This accords with the similar observation that degenerating epithelial cells derived from the bronchial mucous membrane in catarrh and putrid bronchitis often contain cholesterin. The occurrence of this substance in old pus and in old cysts also points to a local origin. Secondly, there is the observation, reported by Naunyn, that the administration of cholesterin to a dog was not followed by an increase of this lipid in the bile. Although it is stated that the cholesterin was absorbed, the experimental conditions appear not to have been wholly satisfactory for testing the question whether an excess of cholesterin in the blood leads to an increased percentage in the bile* We cannot exclude the possibility that there are occasional disorders of nutrition attended with an increase of cholesterin in the blood serum and hence with an increase in the bile.†

Experiments made in my laboratory by Dr. Wakeman give strong support to the view that inflammatory conditions in the walls of the gall-bladder may lead to an increase in the cholesterin of the bile. Dr. Wakeman injected (under aseptic precautions) strong solutions of bichloride of mercury, carbolic acid, ricin, abrin and diphtheria toxin into the gall-bladders of dogs that had fasted for three days. After periods of three to four days the animals were killed. The gall-bladder walls were usually much thickened (especially in the bichloride series) and showed considerable proliferation and desquamation of epithelium together with congestion of the vessels of the submucosa. The solids of the bile were diminished in percentage in the bichloride series. The cholesterin of the bile was markedly increased in the bichloride series, in the carbolic acid series and in the ricin series, the change being especially noticeable in the cholesterin content of the solids. The abrin series and the diphtheria toxine series must be regarded as negative, which corresponds to the absence of structural changes in the mucous membrane of the gall-bladder. Some idea of these results may be obtained from the following table:

TABLE I.

Injection into dog's bladder of

		Normal	$HgCl_2$	C_6H_5OH	Ricin	Abrin	Diph. Toxin
Number of observations		20	12	7	6	5	8
Amount injected			.02 to .1 grm.	.15 to .4 grm.	9 to 12 mg.	1 to 1.75	.08 to .4 c.c.
Total bile, per cent.							
Cholesterin,	Average	.127	.298	.334	.427	.132	.167
"	Highest	.260	.458	.940	.823	.231	.235
"	Lowest	.051	.137	.056	.076	.070	.054
CaO	Average	.077	.064	.072	.079	.110	.094
"	Highest	.115	.166	.111	.150	.134	.155
"	Lowest	.047	.018	.045	.033	.077	.055
Total bile solids, per cent.							
Cholesterin,	Average	.438	2.56	1.47	2.54	.628	.795
CaO	"	.360	.614	.688	.496	.537	.437

Previous to death, the dogs were starved three to four days; those receiving injections were killed three to four days after.

The observed increase in cholesterin, which is especially pronounced in the case of the ricin series, depends partly on the presence in the bile

*A vegetable diet is supposed to diminish the bile-salts and a meat diet to increase them. It is uncertain, however, that these physiological factors assume pathological significance. It has also been thought that decomposition (putrefactive or fermentative) of the bile-salts in the cystic bile reduces the solvent action for cholesterin, but Minkowski showed that the cholalic acid thus liberated still possessed solvent action.

†Dott. F. E. Halia, Batteri Della Calculosi Biliare Coltivati Nella Bile, La Reforma Medica, Vol. II, N. 70, 1901. This observer found in filtered and sterilized ox-bile that colon bacilli and typhoid bacilli gave an acid reaction to bile which had been rendered alkaline. He regards these organisms as the specific exciters of cholesterin stones. The results obtained by Halia do not accord with those obtained by Dr. Dunham on human bile.

‡This conclusion was reached by Mr. Rettger from a careful study of pig's bile.

*The difficulty in carrying out such experiments is considerable, owing to the insolubility of cholesterin in water and its resistance to saponification. It is impossible to insure prompt absorption from the intestine or from the peritoneum and intravenous injections of finely divided substance cause death from embolism. We have not succeeded in heightening the cholesterin content of the bile by experiments of this kind, but do not consider our experiments conclusive as to the question at issue.

†It is extremely probable that the converse is also true and that conditions causing an obstruction to the outflow of the bile lead to an increase in the cholesterin of the blood. This was claimed by Frerichs to be the case. Observations made in my laboratory but not yet completed point to the conclusion that this view is correct.

of cholesterin holding epithelia,* partly on an increased solution of cholesterin† (also of epithelial origin) in the bile. One would anticipate that under these conditions the bile would become saturated with cholesterin and thus prepare the way for the deposition of cholesterin from the bile, perhaps in crystalline form. Crystals of cholesterin were not observed in any instance among the remains of desquamated epithelial cells in the gall-bladder, but these negative results are not surprising if one considers the short duration of the experimental observations.

An increase in the cholesterin in the bile may be observed after slight mechanical injuries to the mucous membrane of the canine gall-bladder, after the intracystic injection of cultures of human colon bacilli, after phosphorus poisoning and after a prolonged diet of fat. Bacteria are certainly not essential to the production of the catarrhal inflammations which are attended with an increase in biliary cholesterin. I have several times found the bile to be sterile in mercurial and other inflammations excited by Dr. Wakeman.

Cholesterin Content of Human Cystic Bile.—At my request Dr. Helen Baldwin has made observations on the cholesterin content of the human cystic bile obtained from more than sixty autopsies. The results of her earlier analyses are given in the following table:

TABLE II.

Showing Cholesterin Content of Human Cystic Bile in Various Conditions (based on 40 autopsies).

Average of all the cases (excluding 8 cases of acute lobar pneumonia and 3 cases with cholesterin stones)	0.13	per cent.
Average in 6 cases of acute miliary tuberculosis (excluding one case with large cholesterin stones)	0.167	per cent.
Average in 12 cases of chronic nephritis	0.20	per cent.
Average in 8 cases of acute lobar pneumonia	0.248	per cent.
Average per cent. solids of bile in 8 cases of acute lobar pneumonia	11.7	per cent.
Average per cent. solids of bile in 50 cases analyzed	11.3	per cent.

There are some points connected with these figures that call for brief comment. In order to obtain strictly normal values for the cholesterin of human cystic bile one would be almost wholly restricted to the results found for biles obtained from healthy individuals who have died by accident. The average given in the table (0.13 per cent.) is based on a series of autopsies which include some instances of sudden death by accident, but which also include a large proportion of deaths from the ordinary causes. These autopsies include, for instance, the series on persons with chronic nephritis. There is consequently no doubt that the average obtained is too high for normal individuals, who would probably give a percentage not very far from 0.1. Nevertheless the comparison with the values found in other groups of cases is of interest.

The relatively high percentage (0.20) found for the 12 cases of nephritis is noteworthy and can hardly be regarded as accidental, although its interpretation is not yet clear. Possibly it depends on an increase in the cholesterin of the serum of the blood connected with the existence of widespread arteriosclerosis in these cases, but it may be due to local conditions in the gall-bladders dependent on the colon bacillus infection which is so common in persons with advanced nephritis. The bile from persons dead of chronic nephritis often contains a dark sediment of very small granules which seem to consist largely of cholesterin and some of which may possibly be the nidus of future gall-stones. The high percentage noted in the cases of pneumonia are also of interest although here again the interpretation of the results is difficult. Possibly the excessive cholesterin is connected with infection of the bile and bile-passages. It would certainly be interesting to know whether the liability to gall-stones is greater among persons who have had pneumonia than among those similarly conditioned who have not had the disease.

It is not unlikely that there are temporary infections of the cystic bile which lead to a temporary increase in cholesterin which gradually returns to normal after the subsidence of the infection.

The bile from gall-bladders containing cholesterin stones is certainly apt to contain an uncommonly high percentage of cholesterin. Thus in one instance the proportion reached 0.308 per cent., in another 2.42 per cent. On the other hand where pigment stones are present the cholesterin of the bile may not exceed 0.014 per cent.

Calcium.—Our knowledge of the calcium of the bile in health and in disease is rather less satisfactory than that which we possess respecting cholesterin. We know that the calcium content of canine cystic bile is normally from 0.050 per cent. to .090 per cent., whereas the percentage in

*In collecting the bile for analysis the loosely adhering cells were in every case (in both normal and pathological gall-bladders) gently removed with a dull spatula and added to the remaining contents of the gall-bladders.

†From experiments made by Mr. L. F. Rettger at the Sheffield Scientific School, it is probable that some general protoplasmic poisons are capable of increasing the cholesterin within the gall-bladder. Thus after a period of phosphorus poisoning of eight days' duration, Rettger found the gall-bladder of a rabbit studded with masses about the size of a pin-head, which responded to the chief tests for cholesterin. The bile was sterile. In three other rabbits, similarly treated, no such masses were found.

Note.—The following observations on the solubility of cholesterin in pigs' cystic bile are of some interest. The analyses were made by Mr. L. F. Rettger. Four portions of same bile, fresh and normal, were taken:

a. 100 c.c. unfiltered; amount of cholesterin..... 0.040 gm.
b. 100 c.c. filtered through good filter paper; amount of cholesterin in filtrate..... 0.044 gm.
c. 100 c.c. frozen two weeks and filtered; filtrate thoroughly washed; amount of cholesterin..... 0.042 gm.
d. 100 c.c. inoculated with culture of human colon bacillus and incubated two weeks; cholesterin in bile ..... 0.036 gm.

Similar observations on normal bile filtered and unfiltered gave comparable results to (*a*) and (*b*).

100 c.c. of normal pigs' bile inoculated with culture of human colon bacillus and contaminated with an unrecognized putrefactive organism, was incubated for two weeks. No bile became putrid. Amount of cholesterin after putrefaction ..... 0.0365 gm.

This represents a loss of 0.0203 gm. during putrefaction (based on comparison with control).

The following observations relate to the influence of acid on the solubility of cholesterin:

Two portions of fresh pigs' bile were taken.

a. 100 c.c.; amount of cholesterin..... 0.0883 gm.
b. 100 c.c.; 3 c.c. normal HCl solution. Allowed to stand 4 days at room temperature. Filtered and residue thoroughly washed. Amount of cholesterin ..... 0.0781 gm.
(Difference=0.0102 gm.)

the blood is considerably lower.* We know also that the calcium content† of human cystic bile does not normally differ materially from that of canine cystic bile and is commonly below 0.10 per cent. Why the percentage of calcium in the bile is higher than that of the blood, and higher even than that of the serum, is not yet clear. It appears improbable that the difference is due to the absorption of water from the gall-bladder and it is more likely to be dependent on an actual addition of calcium to the cystic bile. This point could be settled by a comparison of the calcium of the blood serum with that of the hepatic and cystic bile in the same patient or experimental animal, but the necessary observations appear to be wanting.

A noteworthy thing about the cystic biliary calcium in pathological conditions is that it seldom varies greatly in percentage from that of normal bile. In this respect the calcium of the bile stands in marked contrast to the cholesterin. The comparative uniformity of the calcium values is observable both in experimental and human pathological conditions. Thus in the experimental inflammations of the gall-bladder, already referred to, the average calcium content of the bile was not greater than the average of the normal biles. This applies to the experiments with bichloride of mercury and to those with carbolic acid and ricin. (See Table I.) Increased cholesterin, however, is a feature of these experiments and has been commented upon already. This independence of the calcium and cholesterin of the bile is of interest when we consider the varying composition of gall-stones in respect to their constituents.

A moderate increase in the percentage of biliary calcium, or at least high values for calcium —was observed in some of the cases of experimental cholecystitis. The highest percentage observed in any case relates to one of the mercury experiments where the calcium reached 0.166 per cent. In the cases where the calcium appeared to be high no explanation of the fact has been evident. The calcium content of the blood serum in such cases was not ascertained.

In human pathological conditions, also, the calcium of the bile seldom shows any remarkable increase above the normal. The average calcium in Dr. Baldwin's‡ 40 observations was 0.072 per cent. Three times only was the calcium in excess of 0.120 per cent. Once it reached 0.272 per cent., once 0.214 per cent. and once 0.181 per cent. The solids in these instances were exceptionally high (17.7 per cent., 21.5 per cent. and 21.7 per cent.) but there is no close relationship between calcium and solids in the 40 observations regarded as a group. Neither is there any relation between the cholesterin content of these human cystic biles and their cholesterin. High cholesterins with low calcium are very common. High calcium with low cholesterin is less common but is sometimes a striking feature. Thus in a case of lobar pneumonia in which the calcium value was 0.272 per cent. the cholesterin was only 0.136 per cent. In 7 cases in which the calcium was in excess of 0.10 per cent. advanced chronic nephritis was present in 4 instances.

It should also be mentioned that in two cases in which the gall-bladder contained pigment stones the calcium content of bile was low, in one case 0.046 per cent., in the second 0.018 per cent. These observations suggest that a high percentage of calcium is not a prerequisite for pigment stone production. although there is no proof that the calcium of the bile was normal at the time when the stones were in process of formation.

What is the source of the biliary calcium in those cases where this element is present in excess? A satisfactory answer to this question cannot at present be given but there are several considerations which give at least a clue to the answer. The very high calcium percentage in the bile, as compared with the normal calcium percentage of the blood serum, in some pathological conditions, makes it unlikely that the excess of calcium comes directly from the blood into the hepatic bile. The widely held view that persons living in limestone districts are especially liable to gall-stones led Jankau to feed a dog large doses of calcium phosphate, neutral calcium phosphate and calcium lactate in order to determine whether the biliary calcium could be thereby increased. He obtained negative results. This experiment cannot, however, be regarded as establishing the doctrine that the calcium of the food (and hence of the blood) under no circumstances influences the biliary calcium. An increase in the calcium of the blood may be followed by a moderate increase in the calcium of the bile for Dr. Wakeman found the average calcium content of the cystic bile of 20 normal dogs to be equal to 0.077 per cent. of calcium oxide, whereas in the biles from 12 dogs intravenously infused with a calcium chloride solution* the average percentage was 0.886 per cent., and in one instance reached 0.152 per cent. which is distinctly higher than any normal observed. Although the experimental conditions were unlike any that arise in man these observations leave it an open question whether the calcium of the bile may not be somewhat increased if for any reason the calcium content of the blood is heightened. But it appears improbable that a considerable excess of calcium can be accounted for in that way and it is furthermore unlikely that concentration of the cystic bile is an important factor, even where the effects of concentration are added to those of a high calcium percentage in the blood.

*The following observations on the calcium of the blood and the cystic bile from the same dogs are not without interest.

	Per Cent.		Per Cent.
Dog I.	CaO of bile.. 0.078	CaO of total blood.....	0.0153
Dog II.	CaO of bile.. 0.068	CaO of total blood.....	0.0116
Dog III.	CaO of bile.. 0.056	CaO of total blood.....	0.0091
Dog IV.	CaO of bile.. 0.044	CaO of total blood.....	0.0091
Dog V.	CaO of bile.. 0.068	CaO of blood serum...	0.014
Dog VI.	CaO of bile.. 0.056	CaO of blood serum...	0.017

†In every instance where calcium is referred to in quantitative terms calcium oxide is meant.

‡Naunyn, Klinik der Cholelithiasis, p. 15, 1892.

*From 1 to 2 grams of calcium chloride were introduced in this way.

The view expressed by Gilbert that the biliary calcium is largely derived from the mucous membrane of the gall-bladder through its mucous and desquamated epithelium is probably in large part correct. The acid mucin is probably combined with calcium when it passes the mucus from the mucous glands into the cystic bile or into the hepatic bile. One would therefore anticipate that whenever there arises a catarrhal inflammation of the gall-bladder the conditions would become favorable for an increase in cystic calcium and hence for a precipitation of calcium salts. But so far as I am aware careful experimental data relating to this point are lacking.*

An excessive concentration of the biliary calcium is probably answerable for the deposition of salts of lime, especially calcium carbonate and calcium phosphate. Calculi containing such salts in abundance are sometimes found in cattle, and foreign bodies in the human gall-bladder may undergo incrustation with calcium salts. In true human gall-stones, however, the inorganic combinations of calcium are of less significance than the unstable and comparatively unstudied organic compound known as bilirubincalcium.†

The conditions under which bilirubincalcium separate from the human bile to enter into the composition of calculi are only imperfectly understood and deserve painstaking study, since bilirubincalcium is so common a constituent of gall-stones. Naunyn showed that mere concentration of the bile, at least in the case of dogs' bile, does not suffice to bring about the separation of bilirubincalcium. Observations already referred to in this paper render it improbable that increased concentration of calcium salts necessarily occasion precipitation. If other conditions are operative separation may occur when the calcium content of the bile is not excessive. This inference seems to be justified by the fact that one may discover bilirubincalcium in the sediment of human bile in the absence of an unusual precentage of lime. An important factor in favoring precipitation is the reaction of the bile. A pronounced alkaline reaction to litmus facilitates separation. Still we do not know how frequently this factor comes into play in the production of human biliary calculi. Finally, it is known that the presence of proteids may exert a powerful effect in determining a deposition of bilirubincalcium from the bile. Variations in the biliary proteids may thus come to assume importance for the pathogenesis of calculi. It belongs to future investigations, however, to establish the conditions under which the proteids of the bile play a part in causing the precipitation of bilirubincalcium. It seems not improbable that this precipitation will be shown to depend on the cooperation of several variable influences, the efficacy of a single factor, such as alkalinity, being commonly dependent on associated conditions.*

Relation of Bacteria to Gall-stone Production.—It has been shown that the chief constituents of gall-stone, cholesterin, and bilirubincalcium, have their origin in local alterations of the mucous membrane of the gall-bladder involving desquamation of epithelium on the one hand, and probably an increased production of mucus by the mucous glands, on the other. Hence it is appropriate to inquire into the causes of these local alterations, which are the common accompaniments of cholecystitis.

Bacterial Origin of Cholecystitis.—Modern studies make it clear that the various forms of cholecystitis are in almost all instances of bacterial origin. The chief inciters of the inflammatory process are *Bacillus coli communis, Staphylococcus albus, Staphylococcus aureus, Streptococcus pyogenes, and Bacillus typhosus.* Frequently one type of organism is obtained in pure culture from the bile, but at times two or more varieties are found in association. The character of the alterations in the walls of the gall-bladder and in the bile depend on the nature of the organisms and their degree of virulence. The chemical characters of the bile, as influenced by these different conditions, have not yet received the attention they deserve. Some characteristic relations have, however, been noted, which are worthy of mention. Thus the cystic bile in the typhoid infection of the gall-bladder, so commonly found in typhoid fever, is increased in amount, watery, dirty brown in color and contains an abundance of epithelial cells and epithelial detritus. A mild cholecystitis is present in such cases although it commonly happens that there are no distinct symptoms referable to the gall-bladder. The occurrence of so much desquamated epithelium is suggestive of a rich source of cholesterin, and it would be well worth while to actually determine the cholesterin in a series of such typhoid biles.

The relation of cholecystitis to gall-stone formation is strikingly shown by a table of 32 cases of typhoidal cholecystitis compiled by Ehret and Stolz † which were either subjected to autopsy or came to operation. In 20 of these 32 cases gall-stones were present! This is of course a very high proportion as compared with the percentage observed in autopsies made at random on persons of the same age and sex.‡

From what we know at present of infectious cholecystitis it is safe to say that such processes

*This point can probably be settled experimentally by means of poisoning by toluylendiamine, since this substance markedly increases the mucus of the bile, even in the small hepatic ducts.

†Bilirubincalcium can be precipitated by the addition of calcium chloride to an ammoniacal bilirubin solution. It forms a rust-colored flocculent deposit which has a metallic green luster when dried over sulphuric acid. It is a definite compound, in which bilirubin behaves like a monobasic acid, and is represented by the formula $(O_{16}H_{17}N_2O_3)_2Ca$. It is insoluble in water, alcohol, chloroform and ether. A corresponding sodium compound can be prepared.

*It is said that the presence of bile salts tends to prevent the combination of bilirubin and calcium (Brockbank). Another factor which may influence precipitation is the quantity of bilirubin in the bile. It is especially desirable that the influence of mucin and of albuminous inflammatory exudates should be studied.

†Experimentelle Beiträge zur Lehre von der Cholelithiasis Mitt. aus der Grenzgeb. der Med. u. Chirurgie, Bd. VII, 2. and 3. Heft, S. 372.

‡It is noticeable that the average age of these patients with typhoid cholecystitis is less than twenty-eight years.

afford conditions favorable to the production of cholesterin and mucus in excess, although we do not yet know under precisely what conditions their overproduction is most likely to happen. It seems probable from experimental data that infections of a moderate or slight degree of virulence are most likely to result in conditions favorable to gall-stone production, a supposition which accords well with the frequent absence of a history of acute cholecystitis preceding symptoms of gall-stone colic.

Occurrence of Bacteria in Gall-stones.—It has now come to be generally admitted that a large proportion of gall-stones from the human subject contain bacteria in their centers, sometimes living, sometimes uncultivable. M. Galippe* apparently deserves the credit of initiating the investigations which have led to this important conclusion. In 1890, about four years after the publication of Galippe's first paper, Welch found the *Bacillus coli communis* and the *Staphylococcus pyogenes* in gall-stones and since that time the subject has been studied by Gilbert and Dominici,† Gilbert and Fournier,‡ Hanot,§ Létienne‖ and others. The *Bacillus coli communis* and the typhoid bacillus have been the organism most frequently found.¶

No careful and extended studies have yet been made with a view to determining whether there is apt to be a relationship between the nature of the bacteria derived from gall-stones and the chemical constitution of the stones. There is some reason to think that pure cholesterin stones are often associated with a nucleus which contains colon bacilli, and it has been claimed that the *Streptococcus pyogenes* is apt to be associated with stones rich in calcium salts.

Experimental Production of Gall-stones.—The mere presence of pathogenic bacteria in the centers of gall-stones, though a fact of much interest, is far from being a proof of the micro-organic origin of biliary calculi. If, however, it could be shown that the experimental introduction of such bacteria into the gall-bladder, under suitable conditions, is often followed by the formation of gall-stones hardly distinguishable from human calculi as regards constitution and bacterial contents, this would constitute an indestructible prop to the doctrine that bacterial infections lead to the production of calculi. Efforts to induce gall-stone formation in this manner were for a long time unrewarded by success. In 1897, however, both Gilbert and Fournier* and Mignot† reached the important goal for which they had striven, and obtained definite calculi by infecting the gall-bladder with the *Bacillus coli communis.*‡ It was soon afterward shown that true biliary calculi very closely resembling those found in human gall-bladders, as regards form, color, stratification and bacterial contents, can be experimentally induced through infection with *Bacillus typhosus.*

This result is of the first importance to gall-stone pathology, for it has brought a knowledge of the leading conditions requisite for the production of calculi through infection.

The Conditions of Calculus Production From Infection.—(*a*) Degree of Virulence of Micro-organisms. The mere introduction of virulent micro-organisms into the gall-bladder of an experimental animal does not usually suffice to induce gall-stone formation. Such organisms generally set up an acute cholecystitis and the very severity of the process defeats the desired end by causing destructive or atrophic alterations in the mucous membrane of the gall-bladder, that lead to interferences with the continued overproduction of cholesterin underlying calculus formation.

If, however, the infective agent be first attenuated in virulence, as suggested and practised by Mignot, the chance of inducing stone formation is very greatly increased. This is apparently for the reason that bacteria attenuated in virulence set up a subacute cholecystitis peculiarly favorable to the establishment of cholelithiasis. A further precaution which helps to insure success in causing experimental cholelithiasis is the cultivation of the bacteria employed, in diluted bile, during several weeks before their introduction unto the gall-bladder. This procedure appears to facilitate the adaptation of the bacteria to the normal bile, by which they secure a permanent foothold in the gall-bladder.

As to the kind of organisms capable of inducing gall-stones Mignot's work shows that *Bacillus coli, Bacillus typhosus, Staphylococcus pyogenes, Streptococcus pyogenes* and even *Bacillus subtilis* may each be successfully employed as inciters of gall-stones. But their degree of virulence appears much more significant in this connection than the variety of micro-organism. (*b*) Retention of Micro-organisms in the Gall-bladder. It is obvious that an essential condition for experimental gall-stone production is the retention of the living infective agents within the gall-bladder. Two natural defenses of the normal organism are constantly opposed to the es-

*Galippe's very suggestive paper is entitled Mode de Formation du Tartre et des Calculs Salivaires: Considérations sur la Production des Calculs en général; Présence des Microbes ou de leur germes dans les Concrétions (Journal des Connaissances Médicales, 25 Mars, 1886).

†La Lithiase biliare est-elle de nature microbienne? (Soc. de Biol., 16 Juin, 1894.)

‡Du role des microbes dans la genèse des Calculs biliares (Soc. de Biol., 8 Février, 1896).

§La Fièvre typhoïde et lithiase biliare (Bull. Méd., 22 Janvier, 1896).

‖Calculs pariétaux de la vésicule biliare (Congrès de Médicine tenu a Bordeaux, aout, 1895, et Médicine Moderne, 17 aout, 1895).

¶Only intact calculi should be bacteriologically studied as the lightest abrasion permits the entry of intestinal bacteria. Calculi covered with a pigmentary stratum are impervious to bacteria, but pure cholesterin stones, without such protection, are liable to permit the invasion of intestinal bacteria after death.

*Gilbert, A. Note pour servir à l'histoire de la theorie microbienne de la lithiase biliare, Archives Générales de Médicine, Vol. II, p. 257, Septembre, 1898. Gilbert was put on the path leading to success through observing in conjunction with Dominici (Angiocholite et cholécystite typhique expérimental, Comptes Rendus de la Soc. de Biologie, 23 Décembre, 1893, p. 1033) in 1893, that little concretions ("petites concrétions verdâtres") formed in the gall-bladder of a rabbit with typhoidal cholecystitis. After this methodical attempts were made to obtain more typical concretions.

†Reported at the Société de Chirurgie, May 19, 1897. See Hartmann, M. H., Pathogénie de la Lithiase, La Presse Médicale, No. 19, 2 Mars, 1898, p. 111.

‡The priority in this work belongs to Gilbert, although Mignot made the first public announcement of his results. See Cushing, Johns Hopkins Hospital Bulletin (Nos. 101 and 102) p. 168, 1899. Cushing, Richardson and Lartigau, in this country, have each succeeded in producing calculi by infecting the gall-bladder.

tablishment of bacteria in the gall-bladder. One of these depends on the fact that the bile (at least in the case of dogs) is a poor medium for the multiplication of certain kinds of bacteria and when fresh is not in general an ideal basis for bacterial growth. While it is very doubtful whether even quite fresh bile has any antiseptic action the relatively slow multiplication of intestinal bacteria in this medium (as compared, for instance, with bouillon) during the first hours after infection, must operate as a protection against injury from micro-organisms, provided the bile has a free exit and is not permitted to remain many hours in stagnation. In health there is a free exit both for the cystic and the hepatic bile and the normal bile current into the duodenum is such as to constitute a most effective defense against the domicile of bacteria within the bile-passages. It is easy to satisfy oneself of the importance of this normal bile outflow by injecting bacteria of moderate virulence into the gall-bladder, where they fail to gain a foothold. The outcome is, however, greatly altered if one first ties the cystic duct or detains the micro-organisms by means of foreign bodies to which they cling. Mignot made effective use of the latter method. In one set of observations these foreign bodies, impregnable with the bacteria to be tested, were permitted to sojourn in the gall-bladder during the entire period covered by the experiments. In another series the foreign bodies were removed by operation after a lapse of three or four weeks, during which time the bodies were operative in keeping bacteria in contact with the mucosa, thus facilitating the establishment of a cholecystitis. In both sets of observations the animals were killed after four or five months and the gall-bladders were found to contain concretions comparable with human calculi, chemically, physically and bacteriologically. Some of the stones resembled the pure cholesterin stones of man. A few contained some sodium chloride and some bile-acids and bile pigments.

The Influence of Foreign Bodies.—The observation that various foreign bodies* have occurred in the centers of human gall-stones has led some writers to attach considerable importance to these accidental inmates of the gall-bladder, as inciters of stone production. If, however, we leave out of consideration the epithelial masses (which cannot be classed as foreign bodies) and the masses of bacteria so often discovered at the centers of gall-stones, definite foreign bodies are rare constituents of calculi. Nevertheless it is interesting to consider for a moment what influence foreign bodies have upon the separation and crystallization of the constituents of calculi. It is certain that sterile glass beads and similar bodies can be left in the gall-bladder of an animal for many months without occasioning the formation of any concretions.† This negative result can not, however, be interpreted to mean that foreign bodies are always without influence upon the production of calculi, for it is undeniable that just in so far as they interfere with the complete expulsion of the cystic contents do they favor the accumulation of micro-organisms in the gall-bladder. In this way human gall-stones may become operative in facilitating reinfection of the gall-bladder at any time after the death of the bacteria to which they owe their birth. It is interesting that even a stone with a smooth surface facilitates the retention of bacteria in the gall-bladder on account of the layer of fluid which clings to their surface owing to the operation of capillary attraction. Porous stones one would expect to be even more effective owing to their impregnation with bacteria.

The Influence of Mechanical and Chemical Irritants.—Experimental damage to the walls of the gall-bladder by heat (cauterization), scratching, and the application of silver nitrate was found by Myake to be without influence in causing infection. The bile remained sterile in all experiments of this kind. In my laboratory we have had a similar experience with injections of mercuric chloride. These results are, of course, no evidence that chemical irritants causing an excess of cholesterin in the bile might not in time lead to the production of gall-stones even in the absence of infection. On the other hand, there is at present no unimpeachable evidence for the view that stone formation occurs independently of infection, where the stone-forming elements of the bile are increased.

The Micro-organisms of Normal Bile.—The not inconsiderable literature relating* to the bacteriological examination of the normal bile of dogs, rabbits and guinea pigs indicates that in a majority of instances the bile is sterile, at least so far as can be judged by the ordinary methods of examination, in which small quantities of bile are employed in making cultures. Observations made at my suggestion by Mr. L. F. Rettger are in harmony with this view. Rettger made cultures from the bile from six normal dogs, with negative results in every instance. Smears made with the bile taken from the gall-bladders of 32 normal pigs showed growths in only three instances.† That the bile of guinea pigs and of rabbits is ordinarily free from pathogenic organisms is made probable by experiments of Fraenkel and Krause,‡ in which they snipped the gall-bladders and permitted the bile to run into the peritoneal cavity without causing infection.

These various results cannot be regarded as absolute proof that the bile is strictly sterile in most instances, for it was found by Ehret and Stolz that the contents of the gall-bladder was

*Among the bodies noticed have been silk and metal ligatures, globules of mercury, a pin, clots of blood, etc.

†See Ehret and Stolz, also Mignot. A sterile silk thread may in time become encrusted with calcium salts, although the bile remains sterile, but it is doubtful if foreign bodies ever lead to a precipitation of bilirubin or cholesterin.

*Zur experimentellen Erzeugung der Gallensteine mit besondered Berücksichtigung des bakteriellen Verhalten der Gallenwege, Mitt. aus der Grenzgeb. der Med. u. Chirurgie, Bd. 6, 4. and 5. Heft, S. 479, 1900.

†In one case the colon bacillus, in a second the colon bacillus and an unknown coccus, in the third case one unidentified bacillus, probably a member of the colon group.

‡Fraenkel and Krause, Zeitschrift für Hygiene, Bd. 32, 1899, pp. 77 to 110.

infected in almost one-half the animals examined by them. These observers made their cultures with relatively large quantities of bile, thus increasing the chances of discovering bacteria. It may be safely stated, however, that the bile of normal dogs, pigs, rabbits and guinea pigs commonly is sterile or contains very small numbers of bacteria (usually members of the colon group).

Very similar conditions prevail in the case of human bile studied at autopsy. Although most of the patients examined by Fraenkel and Krause had died either of acute infectious diseases or with tuberculous lesions, the bile was sterile in 105 out of 128 examinations from the same number of patients.

It is notable, however, that although the bile of 34 out of 36 tuberculous patients was sterile by ordinary culture methods, the bile excited tuberculous lesions in 5 of the 11 guinea-pigs into which injection of the bile was made. It is thus not unlikely that micro-organisms are present in human bile more often than one might suppose from the results of cultures made with single supplies of bile. Even the bile of normal persons may be more often infected than has usually been supposed, but the organisms are probably neither numerous nor virulent in the majority of instances.

Frequency of Human Biliary Infection in Disease.—It is a well-established fact that even in the absence of cystic disease bacteria are likely to be present in human bile when there exist pathological conditions in parts remote from the gall-bladder. The *Bacillus coli communis* and the *Staphylococcus* are among the most common inhabitants of the bile under these circumstances. Other pyogenic cocci, including the *Pneumococcus*, are probably much less often present in the gall-bladder, at autopsies made at general hospitals on patients who have not had gall-bladder disease.

Some kinds of infective agents are easily missed, on account of the difficulty in making them grow on ordinary media. This is certainly true of the *Pneumococcus* and the experience of Fraenkel and Krause with the *Bacillus tuberculosis* makes it likely that this organism is often overlooked. On the other hand the presence of bacteria in the bile at autopsy is frequently to be regarded rather as the evidence of a terminal infection than as the expression of an earlier invasion.

(To be Continued.)

Banti's Disease.—A case of the peculiar symptom-complex known as Banti's disease, developing directly after a severe trauma to the splenic region, is reported by D. FICHTNER (Münch. med. Woch., Aug. 11, 1903). The view that the condition is only a manifestation of hereditary, tardy syphilis is gaining more and more ground, though it is often hard to obtain a history of syphilis in the parents and the patients only rarely show other signs. The author's case presented all the typical symptoms and in addition, went through a facial erysipelas complicated by a suppurative otitis media.

THE MODERN TREATMENT OF THE ACUTE SUPPURATIONS OF THE KNEE-JOINT.

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ETIOLOGICALLY, the acute purulent inflammations of the knee-joint can be divided into three groups. To the first belong the metastatic suppurations observed in infants shortly after the detachment of the stump of the cord, and in women during the puerperal period. But they are not rare in any form of pyemic fever, be its cause otitis media, or osteomyelitis or gonorrhea, or in fact, any conceivable order of suppuration, in which septic thrombi become detached and are carried into the portal or systemic circulation.

The second group is composed of cases in which the purulent infection of the joint is due to a direct perforative extension of the pyogenic process from an adjoining focus of suppuration as of an acute or chronic osteomyelitis.

The third group contains cases in which the septic infection is carried to the joint by a penetrating traumatism, laceration, stab, incision, or gunshot, either directly into the main articular space, or indirectly, through one or another of the accessory synovial bursæ. Such are the quadriceps bursa, the bursæ found underneath the semimembranosus, and those of the popliteal space, most of which have an open communication with the knee-joint.

We observe remarkable differences in the destructiveness and virulence of the various forms of acute pyarthrosis. The metastatic suppurations have the mildest character. Next in virulence stand the suppurations communicated from an adjoining focus of infection. The most dangerous are those due to traumatic infection. While in these, by the intense sepsis, limb and life of the patient are placed in jeopardy; the former, unless neglected, will rarely do other lasting damage than a more or less complete disability of the joint.

When the initial sepsis does not destroy the patient's life, and no steps are taken to relieve the process by surgical measures, we see that the thickened and congested synovial capsule will be eroded and perforated. With this a certain quantity of the septic contents of the joint will escape into adjoining areolar spaces, and the enormous intra-articular tension being somewhat relieved, the local and general symptoms will show a certain abatement. But this improvement is temporary only, lasting not longer than the time required for the tense repletion with pus of the secondary abscess or abscesses. These, in turn, will break down intervening barriers, the suppuration extending along the lines of least resistance upward into the thigh, or downward, following the areolar planes of the muscles and tendons of the leg.

Exceptionally, when the perforation of the synovial membrane corresponds to the anterior or lateral aspects of the joint, where the abscess becomes at once subcutaneous, the integument may

be perforated also. Thus a short fistula may be established, leading directly into the joint cavity.

But the destructive action of the septic process is not limited to the capsule alone; it involves the cartilaginous joint surfaces also. These become discolored, roughened, and separated from the underlying epiphysis in the shape of smaller or larger irregular tatters. This loss of the articular cartilages is the cause of the subsequent anchylosis.

The diagnosis rests mainly upon the proof of the facts, that the joint is distended by an exudate, and that the distending material is pus. We need not dwell upon the physical signs of distention of the knee-joint. The change from the normal shape of the joint to that characteristic of a distended joint, the presence of fluctuation and of ballottement of the patella will suffice. Where such distention is accompanied by intensely septic general symptoms of growing severity—even to the so-called typhoid status—when, at the same time, the local disability, tenderness to touch, the exquisite pain and the edema of the integument all point to a destructive process, the crucial question of "pus or no pus" should be immediately put by means of the aspirating needle.

Errors of diagnosis are rare in pyemic or in traumatic cases, more common, however, when the joint suppuration is due to perforation from an adjoining focus of acute osteomyelitis. Of diagnostic errors that have come under my personal observation, that of acute articular rheumatism was the most frequent one, then followed cerebrospinal meningitis, and finally typhoid fever. A careful and systematic going over of the whole body of the patient, especially when he is more or less comatose, will soon establish the presence of the characteristic, pale and deep-seated edema of the lower end of the femur or of the upper end of the tibia. Pressure over the epiphysial line will not fail to elicit signs of distress, even in a deeply comatose patient, and the practitioner, if his diagnosis be made early, will at this stage find no abnormality about the joint.

Let us now enter into a separate study of the three groups above defined.

1. *Metastatic or pyemic suppuration.*—Ordinarily the onset of this trouble is mild, its course inclined to be chronic. The local symptoms are not very salient and are often obliterated by those of the general condition, so that they may be overlooked both by patient and physician. Occasionally, however, they will be very acute and obtrusive. The mildest infantile forms show even a tendency to spontaneous cure, and ought not be meddled with. They occur frequently during and after puerperal fever, accompanied by purulent collections in other joints, and as before mentioned, in the new-born, at the time of the separation of the umbilical cord. If the local symptoms are troublesome they will demand surgical interference. First evacuation by puncture, and if the collection be ropy and thick, by irrigation. Rapid reaccumulation will demand incision and drainage. The number of incisions must depend upon the acuteness of the local symptoms. In mild cases two lateral incisions, placed along the sides of the patella, and a median incision penetrating the quadriceps bursa will be found sufficient. A rubber tube is placed into each one, and the dressed limb is fixed on a suitable splint, preferably in horizontal suspension. Daily change of dressings and irrigation will follow. As soon as the secretion becomes serous, the tubes ought to be withdrawn. In small children, one, or at most, two incisions will suffice, and here the use of carbolic solutions is strictly to be shunned on account of their highly poisonous influence. In infants, the function of the joint is commonly restored, but this is not exceptional in puerperal cases, especially when they have received prompt and adequate attention. One of the most troublesome forms of metastatic infection of the knee-joint is that due to gonorrhea. Ordinarily it appears in the shape of gonorrheal rheumatism; the places of predilection being the wrists and the knee-joints. The exudate is rarely copious, and the lack of harmony between the moderate physical signs and the exquisite painfulness one of the paradoxes of surgical experience. Only those cases will require active interference in which massive effusion and great tension threaten the integrity of the joint. The course of the malady is very slow and rebellious, but in the majority of cases, the function is restored.

2. *Suppuration due to osteomyelitis.*—Osteomyelitis is eminently a disease of adolescence, being most frequent in the years just preceding puberty. In the lower extremity the place of predilection is the neighborhod of the knee-joint, or more precisely, the lower epiphysial line of the femur, or the upper one of the tibia. In children, the epiphysis itself does not represent a great mass, and, therefore, it is not rare, that having become the seat of osteomyelitis the process extends to the epiphysial cartilage. For a short while this acts as a barrier against the spread of the infection; but as soon as the necrosed part of the cartilage is loosened and flakes off, pus pours into the opened joint and we have to deal with a suppurative gonitis complicating the osteomyelitis. This is the most common form of causation.

At other times, the osteomyelitis having produced an abscess involving the soft parts of the extremity, this abscess, especially when situated in the popliteal space, may perforate into one of the popliteal bursæ which freely communicate with the joint; or, a direct perforation from without inward may occur through the synovial capsule. In all these cases the osteomyelitis must have existed for some time, the involvment of the knee-joint being a late complication. On the other hand, where the osteomyelitic focus penetrates directly into the joint, we see the symptoms of acute osteomyelitis and of acute gonitis compounded and overlapping. In every case of osteomyelitis attacking the tibia or femur near the knee, it will be the duty of the practitioner to watch the joint and not to overlook an effusion

distending it. But the edema of the integument caused by the osteomyelitis, should not be mistaken for an effusion, which must present the classical signs of fluctuation and ballottement. Flexion and rigidity of the joint, being regular companions of osteomyelitis, have also an inferior diagnostic significance.

According to modern ideas, every osteomyelitic focus ought to be freely opened as soon as the diagnosis is made. A free external incision will expose the bone, and the chisel and mallet will lay open the diseased medulla and cancellous tissue. Thus, in favorable cases, the extension of the infection to the articular cartilage may be averted. But where the joint has been attainted, the osteomyelitic focus ought to be followed up and traced to where it perforated the cartilage. To this should be added at once arthrotomy.

In speaking of the treatment of the pyemic forms of gonitis, we have already mentioned the methods of multiple arthrotomy found to be adequate in that class of cases. Experience had taught us, that in virulently septic gonitis two lateral incisions, supplemented by an incision into the quadriceps bursa, did not afford effective drainage. And this is easily understood if we consider the irregular and sinuous conformation of the knee-joint. Hence we saw that Andrews, of Chicago, proposed to make five drainage apertures; one into the quadriceps bursa, two laterally above and two below the patella. Sometimes this proved to be adequate, often, however, insufficient, and the author of this paper, together with other surgeons, sought to render drainage still more perfect by entering the joint posteriorly, through the popliteal cavity, that is at its most dependent portion. The exposure of the capsule in this region, demanded, of course, on account of the popliteal vessels, careful preparatory dissection. This also was found to be unsatisfactory, the reason being, first, that the infection did not concern the surface of the synovial membrane alone, but involved its entire thickness, together with more or less of the underlying tissues; and, secondly, that drainage and irrigation of the complicated joint cavity could never be made perfect by means of multiple incisions.

Mayo, of Rochester, Minn., finally proposed and successfully employed a radical procedure, possessing the greatest value, and which has been deservedly accepted by the surgical fraternity. It consists of the transverse incision of the infected knee-joint, passing from condyle to condyle just above the patella, and, of course, dividing the quadriceps tendon. Ollier, the French surgeon, supplemented Mayo's incision by advising the extirpation of the crucial ligaments.

The advantages of Mayo's incision are manifest. The joint having been widely opened along three-quarters of its circumference, direct access to all its recesses becomes easy, especially if the crucial ligaments be also divided. Each of the sinuosities of the capsule can then be inspected and subjected to direct local treatment by packing. To do this thoroughly, the knee is flexed to an angle of 45°, and after due packing is dressed in this position. Experience has taught us the great advantage of this treatment over irrigation, even if permanently employed. The contact of the medicated packing with the diseased capsular tissues favors profuse exudation, by which they are rapidly depleted of infectious matter. Ordinarily, the local and general septic symptoms rapidly subside, and within a week or ten days, the flexed joint can be again extended, in which position it is permitted to heal. Where most or all of the articular cartilage was preserved, even a certain degree of the function of the joint may be regained. Extensive loss of the cartilages, however, must end in firm anchylosis.

Experience enables me warmly to recommend Mayo's incision, where the virulence of the infection threatens the loss of the patient's limb and life. To illustrate its effect, the history of a typical case may here be quoted.

Yette G., thirteen years old, admitted April 8, 1902, to Mt. Sinai Hospital. Two weeks before admission she sustained, by a fall, an injury to the left lower extremity. Ever since then she was unable to walk. During the last four days she has had a number of severe chills followed by high fever. On admission considerable swelling extending from the hip to the knee was found, which was rigidly flexed. The joint, especially the quadriceps bursa, was much distended and exquisitely painful, the patella floating, and marked tenderness was observed along the lower epiphysial line of the femur. Temperature, 104° F., pulse 130. The diagnosis of acute osteomyelitis with involvement of the knee-joint being made, an immediate operation was decided upon. Aspiration of the knee-joint yielded pus. It was laid open by a transverse incision extending from epicondyle to epicondyle, and dividing the ligamentum patellæ. A large amount of thick pus was evacuated. The synovial membrane was found to be very edematous, with a reddish brown discoloration, the articular cartilages smooth and yellowish in color. The quadriceps bursa was also distended with pus, its synovial lining edematous and hemorrhagic. After a thorough cleansing and packing of the joint cavity, the lower extremity of the femur was exposed by an external longitudinal incision. The periosteum having been raised, the medullary cavity of the shaft and the cancellous tissue of the epiphysis were exposed by a fenestrum made with the chisel and mallet. In a well-defined area, they were found to be filled by pus and liquid fat. Spreads of the pus contained staphylococcus. This purulent area was removed by means of a scoop, and the resulting cavity was packed. The limb was dressed in the flexed position. Immediately the temperature and pulse rate began to descend, slowly but steadily. The dressing became rapidly permeated by a copious sanguinolent discharge, and its external portions had to be changed very frequently. By April 13 the morning temperature had fallen to 100° F., the evening temperature being 102° F.; the pulse about 100. The

deep dressings were then changed. The synovial membrane presented a clean, granulating surface, no retention was present. The osteomyelitic cavity also showed healthy granulations. The limb was extended, and the recesses of the knee-joint as well as the bone cavity were lightly packed, after which the extremity was fixed upon a dorsal splint. April 19 the flap containing the patella was sutured back into its normal position. By the end of April all the febrile symptoms had disappeared, and the cavities began to close up. June 30, all the wounds were healed, and mobility of the joint began to assert itself within an arch of 10 degrees. Presumably this would increase in due course of time. July 5 she was discharged cured. Walks well and is in an excellent general condition.

In my student days, along the late sixties of the past century, an acute septic suppuration of the knee-joint was considered as one of the fixed indications for amputation of the thigh. The excellent results of Mayo's incision have certainly helped to restrict the scope of this indication more than any previously known measure, but have not obliterated it completely. The following history will prove the fact:

Elsie L., twelve years old, admitted to Mt. Sinai Hospital, November 1, 1901. Nine days before this she had a fall, injuring her right leg, but was able to walk home. Two days later severe pains set in at the right knee with repeated chills, very high fever, much vomiting and great prostration. On admission we found her internal organs normal, right knee was rigidly flexed, but showed no signs of distention. The upper end of the tibia was the seat of a considerable amount of deep-seated edema. Fluctuation was also made out. The integument was pallid and shining. This edematous area was the seat of excruciating pain and extremely tender to the touch. Temperature, 104.2° F., pulse 140. The patient was immediately anesthetized, and the external abscess was widely opened. A ragged opening in the periosteum was found to lead into a large subperiosteal cavity extending downward to the middle of the tibia. The periosteum being raised, the chisel and mallet exposed the interior shaft and upper epiphysis of the tibia, which was filled with pus. The epiphysial line showed beginning purulent separation. Drainage of bone and external abscess and fixation of limb. Culture of the pus yielded staphylococcus. An immediate improvement of the general condition followed, though the patient continued to be feverish in the evenings. On November 16 the temperature rose to 103° F. An effusion appeared in the knee-joint, which, on aspiration yielded turbid synovial fluid. A thick trocar was inserted, and the joint was thoroughly irrigated with saline solution, then flushed with a 5-per-cent. solution of carbolic acid, and again washed with salt solution. For a few days the fever subsided somewhat, but soon became high again. The knee remained excessively painful. The tibial shaft showed a good tendency to granulate, but the epiphysis threatened necrosis. This led us to expect its perfect detachment, which became evident by Nov. 30. The child began to look markedly septic and aspiration of the knee yielded thick pus. Consequently, the joint, being incised according to Mayo, a certain quantity of pus was liberated. Three perforations of the articular surface of the internal tuberosity of the tibia were found. The quadriceps bursa also was distended by pus and had to be incised. The necrosed portions of the epiphysis were removed by means of the gouge, all the cavities were packed, and the limb put up in flexion. These steps were also followed by a passing and short improvement, but the gradual and complete necrosis of the epiphysis could not be arrested. The continuous fever, the copious discharges and the pain began to sap the strength of the patient, her liver enlarged, the pulse became very rapid and feeble, hence, to save her life, on Jan. 7, 1902, amputation in the middle of the thigh was done. Patient was discharged cured on Feb. 19, 1902.

Chronic ulcerative osteomyelitis, the common sequela of acute osteomyelitis, may also lead to perforation of the articular cartilage and to acute suppuration of the knee-joint. In one of the writer's cases (Wm. Kaplan, admitted May 10, 1898), this accident occurred ten years after the first attack of the acute disease. Originally a large sequestrum of the femur was extracted. The wound healed, and limb remained sound for five years; then, within the last five years it was operated upon for relapses four times, all involving the epiphysis, of which finally not more than a shell was left behind. May 13, the fifth time the cavity in the epiphysis was curetted. On May 30 suppuration of the knee-joint became manifest. June 2, Mayo's operation was performed. The articular cartilage was found to be extensively necrotic, together with the underlying remnants of the epiphysis. It became evident that the limb would be useless after the loss of the entire epiphysis. And as its remnants continued to necrose, this process maintaining an exhausting septic fever, amputation was done on June 23. On July 23 patient was discharged cured.

3. Traumatic Suppuration.—The author's first acquaintance with this dreadful form of infection was made in 1878. The patient was an old lady of about seventy years, who was much annoyed by a swelling occupying the inner aspect of one of her knees. The family attendant, an enterprising young practitioner, had correctly diagnosticated a chronic inflammatory distention of the bursa found underneath the semimembranosus tendon. In those days Fergusson's surgery was one of the accepted text-books, and our confrère went to this author for guidance. Fergusson recommended for curing bursitis or a ganglion, the drawing of a *seton* through the offending sac. For 36 hours the seton had caused little trouble; but then the bursa became infected, and rapidly the contamination spread to the knee-joint, with which the bursa had an open communication. The present writer stepped into the case at this stage of the malady, finding a thoroughly septic old

woman suffering from far gone arteriosclerosis and a fatty heart, having albumin, casts and sugar in her urine, the knee-joint distended with pus, the pulse rate and temperature very high, the patient failing. Incisions, irrigation and drainage were immediately resorted to, but without avail. The synovial lining of the joint was found extensively necrosed, and the patient succumbed within forty-eight hours after the onset of the gonitis, under the symptoms of combined sepsis and diabetic coma.

It may be justly remarked, that in this instance senile decay, chronic nephritis and the diabetes had as much to do with the fatal issue as the infection. But the following histories will demonstrate that traumatic infection of the knee-joint is a terrible enemy even under the most favorable conditions of general health.

Mrs. Alice H., thirty-eight years old, a butcher's wife, admitted March 14, 1897. Forty-eight hours before admission she fell, while holding an open penknife in her hand, and the narrow blade of the knife penetrated the knee-joint, from which synovial fluid had since then been escaping. She tied a wet rag to the knee, and went about her business. Six hours after the accident the joint became painful and a furious chill and high fever set in. When seen by the writer the joint was distended to the utmost. Just above the patella and corresponding to the internal margin of the quadriceps tendon an incised wound of about one-sixth of an inch in length could be observed. Its margins were reddened, swollen, and from the patulous orifice purulent synovial fluid was escaping at the slightest pressure. The temperature was 103.4° F., the pulse 120; the general signs were those of a profound sepsis. The tongue had become dry and was covered with a brown coating, the patient was somnolent, and vomited most of what she had unwillingly swallowed, and the expression of her face was indicative of great prostration. She was immediately sent to the hospital, where the joint was incised and drained. Two lateral incisions were placed above, two below the patella, and a fifth one directly into the quadriceps bursa. The limb was placed in suspension on a dorsal splint, and the drainage tubes were connected with two irrigators filled with Thiersch's solution, which was passing in a steady, slow stream through the joint. These comprehensive measures had not the slightest effect upon the general condition of the patient, who became profoundly comatose, her temperature rising to, and remaining above 105° F. The heart began to show signs of failure in spite of energetic stimulation. During March 15 30 cubic centimeters of streptococcus antitoxin were injected in three equal doses every six hours, without the slightest appreciable effect. March 16 the urine became loaded with albumin, hyaline and granular casts. A copious saline infusion and another administration of antitoxin did not retard the patient's death, which took place at about midnight; that is just four and a half days after the injury. The entire synovial membrane had become necrosed, and it is very doubtful that Mayo's incision could have changed the issue.

More successful than in the preceding two cases was the application of Mayo's incision in the following instance. The events of the case, while demonstrating that the character of the infection was not of an excessive virulence, yet illustrates the many difficulties the surgeon may have to overcome in bringing the trouble to a successful termination:

Isidor R., nine years old, admitted Aug. 27, 1899. Having been, eleven days ago, accidentally thrown off a car, his right knee was cut. Immediately afterward a practitioner had sewed up the small wound. The second day after the injury he vomited, the third day great swelling of the knee with excruciating pain, a severe chill and high fever set in, whereupon the stitches were removed. Since then a number of rigors had occurred, and the patient was sent to Mt. Sinai Hospital. We found a deeply prostrated boy, his temperature 103°F., pulse 140, with the facial expression of collapse, the entire right thigh enormously swollen and abnormally indurated. On the external aspect of the knee a granulating linear and patulous wound was seen, from which pus was oozing and through which a probe readily penetrated into the knee-joint through a rather narrow sinus. The joint was much distended by pus. Immediately the house surgeon, Dr. Allen, opened the joint by Mayo's incision. The entire capsule was found to be sloughing and most of it was excised. The cartilages looked normal. After packing the wound the limb was put up at an acute angle. The next day the fever was still very high, the thermometer indicating 105.6° F. The boy was anesthetized, and the packings being removed, it was ascertained that no retention was present in the joint itself. The swelling of the femur not having subsided, the suspicion of osteomyelitis became confirmed and was verified by the subsequent events. The cartilages became gradually separated and sloughed off, and a number of periarticular abscesses, both of the leg and of the thigh formed, and had to be opened one after the other. For each of the many changes of the dressings, the boy had to be anesthetized with chloroform. He bore the anesthetic excellently, and the manipulations could thus be done rapidly and smoothly. Portions of the epicondyles of the femur as well as parts of the head of the tibia necrosed and were gradually cast off. By Sept. 26 the febrile state had ceased, but the wound did not look well, the exuberant granulations still manifesting a tendency to ulceration and sloughing. On Oct. 24 the head of the service revised the wound under anesthesia. All the granulations were scraped away. The head of the fibula, necrosed and detached at the epiphysial line, was found floating in an abscess occupying the interosseous space. Careful search not revealing the presence of other abscesses, the rough and uneven articular surfaces of femur and tibia were shaved with a strong cartilage knife, then brought together in their normal position

the first time since admission. The retracted skin flaps were dissected up sufficiently to permit partial approximation of button sutures, and the limb was dressed in the extended posture. The next day the patient's temperature was normal and remained so to the end. In a fenestrated plaster-of-Paris splint the wound healed gradually. Bony union was present by Dec. 1, and the patient then began to walk. The ultimate healing of the wound was retarded by the lack of integument caused by its retraction, but was ultimately accomplished. The boy was discharged cured on April 8, 1900, with a firmly anchylosed joint, and no appreciable shortening.

We shall wind up this subject by bringing another history, quoted from my text-book on surgery. It contains a lesson and a warning:

Max Loffmann, butcher, aged twenty years. Admitted Oct. 25, 1885. On Oct. 12 the submuscular recess of the knee-joint was accidentally incised with a filthy butcher knife. Synovia escaped from the small puncture, and the patient walked a distance after the accident. The next day suppuration of the joint set in with a rigor, but the local practitioner—the patient lived in Jersey City—continued to dress the wound with strips of adhesive plaster. Thirteen days after the accident the patient entered Mt. Sinai Hospital. He was intensely septic, had a dry and foul tongue, high and continuous fever, and large quantities of thin, ichorous pus were seen escaping on slight pressure from the distended joint. Immediately the joint was incised in five places, when it was found that the synovial lining was coated with a greenish gray adherent and putrid membrane, similar to that seen in pharyngeal diphtheria. In making the incisions, a number of small periarthritic abscesses of the size of a pea were traversed by the knife. Continuous irrigation was installed at the same time. The fever remained unabated and locally new abscesses formed around the joint. Therefore, Nov. 4, consent to an amputation was urged upon the widowed mother of the patient, her only son, who, however, declined to permit it, suggesting that an attempt ought to be made to save the limb. Against his better judgment, on Nov. 6, the author performed excision of the knee-joint. As a matter of course, all the newly made wound surfaces were again infected, and profuse suppuration followed, the pus remaining thin and ichorous as before resection. Nov. 18 profuse arterial hemorrhage occurred from the wound. This was temporarily checked by the application of Esmarch's band. Hastily summoned to the hospital the author found the patient blanched and pulseless. A saline infusion seemed to have improved the pulse sufficiently to permit of amputation, which was quickly done in the middle of the thigh. But the patient expired before the Esmarch band was removed. The post-mortem examination revealed a sieve-like perforation of the popliteal vein, and a large oblong defect of the popliteal artery, both of which were found exposed and were surrounded by a massive blood-clot. The walls of the cavity containing the clot consisted of broken down and necrosed tissue. The sawn surfaces of the tibia and femur were necrosed, their edges jagged and eroded. There is little doubt that an early amputation might have saved the patient's life.

In concluding our subject, mention must be made of gunshot injuries to the knee-joint, the statistics of which, drawn from the records of pre-antiseptic wars, presented, whenever an attempt had been made to conserve the limb, most formidable mortality. This mortality rose sometimes to 100 per cent., and compelled the surgeons to condemn every attempt at conservation, and to amputate immediately above the knee. This was the status of knee-joint surgery at the conclusion of the Franco-Prussian war. In the Turco-Russian war, which was ended by the peace of St. Stefano, antiparasitic surgery had its first extensive trial, and came out of the ordeal triumphantly. The surgeons sent by the Baltic University of Riga to serve in the Russian army, foremost among them Bergmann, treated a long series of gunshot fractures of the knee-joint conservatively and antiseptically. No probing was allowed, the surfaces were merely cleansed, disinfected and the limb, being dressed antiseptically was put up in a plaster-of-Paris splint. Almost all of the limbs thus treated were saved. Some joints even regaining their mobility. The lesson taught by that war was verified by the experiences of all subsequent wars, notably by our Spanish and by the Transvaal wars. It demonstrated over and over again that gunshot penetrating the human body rarely carried infection with it, and that gunshot wounds of the limbs, if not associated with dangerous hemorrhage, rarely demanded active surgical interference beyond cleanliness and rest.

Whether the experience of civil life is similar to that of war, the author cannot say, having had no opportunity for personal observation.

WHAT OUGHT WE TO EXPECT FROM CARDIAC DRUGS IN HEART WEAKNESS?*

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SEVERAL causes have of late years been at work to produce all sorts and kinds of neuroses of the heart or debility of the heart muscle and to hasten that degeneration of the circulatory system that comes normally only late in life. The principal causes of this ever-increasing cardiac and arterial weakness are the high tension of our daily life, the nervous strain of some of our pastimes, as bicycling and automobiling in cities, and not the least cause is the constantly and recklessly increasing consumption of coal-tar products for pain, whether for the omnipresent headache, or for simple neuralgias. One hardly realizes this daily tension and its effect on our hearts unless

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we analyze it. We rise on time in the morning (whether by an alarm clock, by the call of a servant, or by habit), eat breakfast and read the paper on time, a clock in every room and a watch frequently in our hand. We then, on time, meet office and outside engagements, college appointments, consultations, always and constantly carefully predeciding the amount of time that will be required and timing the next engagement by this decision. We then carefully subdivide this time and note by our watches even how long we can discuss a subject. An appointment kept by the other party even one minute late makes us restless. During the day long flights of stairs are rushed up, or elevators taken that go with a rush and stop with a plunge. If we drive, either horse or automobile, by the carelessness and haste of bicyclists or pedestrians our hearts stop, jump, or receive the vasomotor contraction check from the sudden anxiety lest we do an injury. If we are in a car or vehicle managed by some one else, we often receive the same real or needless shocks to our nervous systems and hearts. If we are ailing we fight nature's signal to relax and still keep up the pace. If we are actually sick, unless we are seriously ill, we fight and wrestle with the disease, whatever it may be, instead of calmly giving up and allowing the disease to be temporary master of ceremonies. Nature is badly hampered by nervous restlessness and the consequent impaired circulation. A calm mind and an even heart will allow nature to expel the disease if acute, and will mitigate or obstruct chronic disease until the last rampart is taken and the last gun fired.

You have only to change the subject of the above sentences to describe the lives of most men and women of our rapid age and country. Even the school children, and I might say the young children, see too much, do too much, are amused too much, receive too much, compete in school too much, are taught too much, are awake too much for the welfare of their circulation and nervous systems.

Other causes of cardiac debility are oversmoking in young men and too great a use of alcohol in young girls for the ever-increasing frequency of dysmenorrhea. Therefore hygienic treatment, hydrotherapeutic treatment, graded exercise, rest cures, and cardiac tonics are all prescribed more and more year by year.

To enumerate some of the types of cardiac weakness, we might divide them into acute and chronic debility. Acute debility could be due to any of the acute inflammations of the heart, or to acute dilatation, heart strain or athletic heart, which is a term that signifies a definite condition and I believe has come to stay; to collapse, which is really more of a paralysis and hence dilatation of the blood vessels; to syncope; to angina pectoris, and to the cardiac muscle degeneration due to fever.

Chronic cardiac weakness is due to chronic simple dilatation or to broken compensation in valvular disease, to myocarditis, to fatty degeneration of the heart muscle, and to general or local arteriosclerosis. Besides these positive disorders we have all sorts and kinds of neurotic disturbances giving both acute and chronic symptoms. It is unnecessary to even mention the symptoms and signs of any of these various cardiac upsets, but the successful treatment of any of them depends upon the proper understanding of the pathology of the case, and this pathology can only be made positive by a correct diagnosis of the condition. Many cases, however, require not only careful immediate study and discrimination, but even prolonged observation to positively decide the difference between an organic lesion and a neurotic irritation, and until the pathology of the case is understood the treatment will often be unsuccessful and perhaps absolutely wrong.

It is not my purpose to take up each condition above named and then map out a treatment, but I believe if we have some of our old well-worn tools sharpened we may the better mold the flagging heart into a normal condition. Which particular tools each of us will use depends upon our own judgment, and I might say individuality. Our tools in this case are the cardiac tonics and stimulants, and perhaps a little sharpening may make these tools the more ready for use. Let me here say that in speaking of the medicinal treatment of cardiac weakness I by no means intend to minimize or belittle the all-important general treatment above mentioned.

Drugs which increase the strength of the cardiac systole or which increase arterial tension increase the blood pressure in the aorta and consequently increase the activity of the circulation in the coronary arteries, and improve the nutrition of the heart muscle. Hence only such drugs as meet these requirements can be cardiac tonics.

If I may be pardoned a definition or two, I would describe a cardiac tonic as a drug that will more or less permanently strengthen the heart and pulse, and leave the heart in better condition after its action has ceased than it was in before. A cardiac stimulant, on the other hand, is a drug which will stimulate and perhaps for a short time strengthen a weak heart, but when its action has ceased the heart is left really in poorer condition than before unless the cause of the weakness for which it was given has ceased to act. In other words, it irritates the heart to better work, but at the expense of its reserve energy. Some drugs partake of both of these properties, being both quickly stimulant and leaving some permanent increased strength of the heart. Most cardiac tonics act slowly and cause the best results only after a more or less prolonged use. To meet the condition of shock or heart failure, or any sudden cardiac weakness, those drugs which are quickly stimulant to the heart and vasomotor system are indicated. It is a question of momentary emergency and not a question of cardiac nutrition, hence acute cardiac weakness calls for a cardiac stimulant, while chronic cardiac weakness calls for a cardiac tonic.

The principal cardiac tonic is digitalis, while the drugs which resemble digitalis in their action

are strophanthus, sparteine, cactus, convallaria, adonidine, and last, but not least, suprarenal preparations. Stimulating cardiac tonics are strychnine and caffeine, while the cardiac stimulants are alcohol, ammonia, camphor, nitrite of amyl, nitroglycerin and ether.

I do not intend to bore you by taking up many of these drugs, but will briefly state what we ought to expect therapeutically from a few of the most important, as I believe that it is difficult to always select the best drug for each case of cardiac upset, and that it is very easy to misuse a cardiac drug.

The queen and peer of all cardiac tonics is digitalis, and, though it is so well understood, a few words concerning it may not be amiss. The action of a therapeutic dose or the primary physiological action of digitalis is a slowing of the heart, an increase in arterial tension, an increased output of urine, and a diminution or disappearance of dyspnea, edema, exudates, and vasomotor, trophic and digestive disturbances due to the impaired circulation. The heart should rarely be slowed by digitalis below sixty beats per minute. If it is slowed beyond this point, or there is a feeling of constriction in the head, or there is a distinct reduction of the amount of urine passed in twenty-four hours, or the pulse becomes irregular, or there is nausea or vomiting, too much digitalis has been used and it should be stopped. Any or all of these symptoms can develop during the administration of therapeutic doses, due to the so-called cumulative action of this drug. This may be caused by some chemical condition in the gastro-intestinal canal causing rapid absorption of several doses incompletely previously absorbed, or the rate of excretion may be diminished by the kidneys not acting well and the above symptoms of overaction can develop. Hence, when giving large doses of digitalis, the patient should be seen frequently.

The conditions improved by this drug are those of chronic cardiac weakness from any cause except when due to myocarditis or to fatty degeneration, or, more definitely, digitalis should be used in broken compensation in valvular disease, in simple dilitation, in the irritable or weak heart of nicotine poisoning, in strained heart from overwork, overathletic exercise, severe marching, mountain climbing, etc.; also where there is poor vasomotor tone, and where there is edema or exudations with no serious kidney lesions.

The action of digitalis in slowing the heart by its action on the pneumogastric nerve gives the heart a much-needed rest, and the action on the cardiac muscle making the contractions more effective and more complete, thus acts as regulated calisthenic exercise, and the cardiac muscle is increased in thickness and strength. The greater force with which the blood is expelled through the aortic orifice plus the contraction of the blood-vessels so raises the blood-pressure in the aorta that the circulation through the coronary arteries is increased and the nutrition of the heart is improved. The abnormal valvular conditions without adequate compensation that digitalis would most benefit are those in which slowing of the heart would be of value and those in which hypertrophy of the left ventricle would be of value, digitalis acting with the greatest force upon the part of the heart that has the greatest amount of muscle tissue, namely, the left ventricle. As far as the lesion goes digitalis is of greatest benefit in mitral insufficiency, next in mitral stenosis, next in aortic insufficiency, and next in aortic stenosis. The greatest amount of benefit from slowing of the heart is seen in mitral stenosis, while in aortic regurgitation a prolonged disastole due to much slowing of the heart would be a disadvantage, while in aortic stenosis the strong left ventricle contracting against a great resistance should cause digitalis to be used with care. The satisfactory action of this drug when compensation is weakened in valvular disease may be many times repeated, but sooner or later in many cases of severe valvular lesion with recurring incompetency the cardiac muscle becomes so deteriorated that digitalis is no longer able to restore the hypertrophy. Some patients do well with small doses of digitalis long continued for months and even years, other patients with valvular disease and incompetency after the hypertrophy has been restored by digitalis may not again need a cardiac tonic for months until some unusual exercise or mental anxiety or severe sickness has again broken the compensation, and again digitalis will improve the condition. Often, however, in cases that have repeatedly taken digitalis, or in some patients always, one of the other cardiac tonics will serve us better than will digitalis.

In any condition in which the right side of the heart is dilated and incompetent without valvular lesions, as occurs in pulmonary disturbances such as pleurisy, empyema, advanced tuberculosis, and especially emphysema, digitalis is of benefit.

In conditions of sudden cardiac failure or shock from any cause the action of digitalis is so slow, even if given hypodermatically, that it should not be relied upon to meet the emergency. If the shock or cardiac distress can be overcome for the time being by other drugs, digitalis given at the time will in some hours begin to add its powerful stimulation to the heart and blood vessels.

In acute endocarditis occurring as a complication in acute rheumatism it is a hard question to decide as to whether digitalis should or should not be used. On the one hand the heart at this time should not be stimulated to more sturdy contraction. On the other hand the slowing of the heart by digitalis at this time can but do good by modifying the movements of an inflamed organ. If the heart with endocarditis is beating at the rate of 110 beats per minute it would seem good treatment to cause such physiological rest as would be produced by reducing the pulse rate to 80 or 90 beats per minute, or about 30,000 beats less in twenty-four hours, and this by a drug that will not weaken the heart.

In the feeble heart of myocarditis and of fatty degeneration the utility of digitalis is much less

pronounced, and the advisability of using it at all has been questioned. However, in many of these cases if the drug is given cautiously in small doses it will prove of considerable benefit, as many times we are not certain that there is actual degeneration of the cardiac muscle, and also it is impossible to decide how extensive the degeneration is even if we assume that it actually exists. It is plain that we should not deny the patient the possible benefit of digitalis, though at the same time its action should be carefully watched. If the cardiac muscle is not overstimulated at the same time the pressure in the aorta is made nearer normal the better circulation through the coronary arteries may delay the progress of the degenerative process unless there is serious atheroma.

Digitalis should not be used in endarteritis or atheroma and hence ordinarily not in aneurism.

In the insomnia of neurasthenics or where there is general vasomotor debility, when the patient is drowsy when up and wakeful when he lies down, the tone of the blood-vessels being so poor that the blood tends to gravitate to the lowest part of the body, digitalis acts often as a good soporific. It may be used for this purpose alone or if given conjointly with some hypnotic will make a much smaller dose of the latter successful than when it is used without the digitalis. In fact in neurasthenic conditions or conditions of vasomotor ataxia digitalis is a general tonic to the whole system, improving the general circulation and increasing the general nutrition.

In delirium tremens whatever cardiac treatment is given should be given hypodermatically, as drugs administered by the stomach are either not absorbed at all or are absorbed very slowly, which accounts for the harmlessness of the enormous doses of digitalis given by the mouth in this condition.

When there is edema of the lower extremities from anemia, and where there are effusions without kidney lesions, and when there is chronic liver disease, digitalis combined with other proper treatment is always of benefit.

As to the use of digitalis in renal inflammation, the writer is of the opinion that no fixed rule can be given. Theoretically, in acute renal inflammation digitalis should not be used. The same is true in uremic poisoning. However, with low vasomotor tension and a weak heart digitalis should be tried, in not too large doses. If it does not give good results in thirty-six or at least forty-eight hours, it should be stopped. If the results are good the size of the dose should be diminished, as overaction from digitalis can certainly readily take place in kidney lesions.

The contra-indications to the use of this drug are a high tension of the arteries, atheroma, a weak cardiac muscle from prolonged fevers or from fatty degeneration, myocarditis, and ordinarily a serious kidney lesion. Inflammation of the stomach or even severe dyspepsia should cause some other cardiac drug to be substituted.

The best substitute for digitalis is strophanthus, which I am accustomed to describe epigrammatically as "acting just like digitalis, only less so;" viz., it is less of a cardiac muscle-stimulant, less liable to produce nausea and vomiting, less liable to cause cumulative action, produces less contraction of the blood vessels, and, perhaps, by directly stimulating the kidney, is a little more of a diuretic.

The indications for preferring and using strophanthus in place of digitalis might be stated as: (1) When there is need of a cardiac tonic and digitalis produces nausea, vomiting, and too great an increase of the blood pressure; (2) when a cardiac tonic is indicated and the blood pressure is already high; (3) when a rapidly acting cardiac tonic is desired; (4) when there is more nervous irritability and weakening of the heart than actual muscular debility or incompetency; (5) children are very susceptible to the action of digitalis, and hence strophanthus is many times a better drug for them when a cardiac tonic is indicated.

To briefly characterize the less important cardiac tonics, we may say that a therapeutic dose of sparteine sulphate should slightly slow the heart, regulate its rhythm, prevent its nervous irritability, slightly diminish the pulse tension, and moderately increase the output of urine. This drug is not a substitute for digitalis. The indications for its use are irregularity and nervous irritability of the heart, especially when conjoined with general nervousness. I have seen it of marked advantage in the disturbed cardiac action combined with increased tension of the arterioles and diminished output of old age. Muscle or fatty degeneration of the heart, low pulse tension, and dilatation of the heart, or acute cardiac weakness should prohibit the use of this drug.

In regard to cactus, my observations, when a fresh active preparation of the fluid extract has been used, have shown that it would regulate the heart, quiet its nervous irritability, and render large doses or the constant use of strong cardiac tonics often unnecessary. This drug does not cause increased cardiac muscular strength as does digitalis. It is however, of value in having no cumulative action, in seeming not to wear itself out, and to have good action after compensation has been reestablished by digitalis in valvular disease and still some cardiac tonic must be given to keep the compensation intact. When the heart is weak in convalescence from acute disease and digitalis is not a good drug to use cactus is beneficial. The same is true in the debilitated heart of old age when digitalis is contra-indicated on account of its so markedly raising the blood-pressure. In functional disturbances of the heart, as arhythmia, palpitation, or tobacco heart, this drug is of value.

Convallaria and adonidine are to me unsatisfactory drugs.

Barium chloride, though a drug not much used, has a powerful stimulant effect on the heart muscle, and causes the blood-vessels to contract. It acts quickly, and should perhaps be resorted to more frequently than it has been.

The action of suprarenal is now so well understood that it need not be more than mentioned except to emphasize the fact that it acts as a vasomotor and cardiac stimulant only when absorbed from the nose or mouth, and not after it has been swallowed into the stomach.

Of the two stimulant cardiac tonics mentioned, viz., strychnine and caffeine, the former is so much and so well used as to only require the caution that we do not inaugurate its good work too soon in acute disease, but should rather reserve it for the coming emergency. Also, as a general bracer in debilitated conditions or in conditions requiring tonics it is used too frequently and too much. In other words, we are too liable to continue to stimulate our debilitated cases rather than to rest them, and we are just now in the strychnine age, almost every patient receiving strychnine in some form.

Now, what should we expect from caffeine in therapeutic dosage? It quickens the heart, increases the tone of the blood vessels, increases the rate of respiration, stimulates the cerebral functions, increases muscle tone and power, diminishes fatigue, increases the output of urine especially the watery element, and hence raises the specific gravity of the blood, which will then get more water where it can find it.

The indications for the use of this drug are (1) as a cardiac stimulant; (2) as a cerebral stimulant; (3) as a muscle stimulant; (4) as a diuretic; (5) as an antidote in poisoning.

As a cardiac stimulant caffeine may be used at any time when such a stimulant is indicated. It acts quickly to tide over a period of cardiac depression, but is not as quick in its action in acute collapse as the reflex stimulation of a strong alcoholic preparation or the stimulation of ammonia. It is, however, a strong adjunct to the above, and with strychnine makes an active respiratory and cardiac stimulant with no secondary depression, and leaves the heart better than it found it. If there is a good deal of nervous excitability and muscle restlessness other cardiac stimulants and tonics had better be chosen. The same is true where there is high vasomotor tension. As a cardiac stimulotonic, caffeine is indicated in prolonged fevers in place of too much alcohol, and is good in typhoid fever in the form of a cup of black coffee given once or twice in the morning. It is, of course, best to avoid it in the afternoon on account of its tendency to cause wakefulness. It is a good adjunct or temporary substitute for digitalis, but is not a permanent substitute for the latter in cardiac dilatation or in broken compensation. As a cardiac tonic in weakened heart action with poor circulation and mental sluggishness it is often effectual, but patients with good compensation in valvular disease had best avoid the stimulation from much tea or coffee.

As a cerebral stimulant perhaps no drug equals caffeine, not only in cases unused to its action, but in those accustomed to its use.

While we cannot say that there is a true coffee or tea habit, *i. e.*, an intolerable and uncontrollable desire for caffeine, still at the regular hours for coffee and tea stimulation, if it is omitted, the majority of patients miss greatly its effects. The hard brain-worker at irregular hours, as editors, reporters, authors, and students just before examinations, increase the number of hours in which the brain will work well by frequent cups of coffee, learning that it is the best and most effectual stimulation that they can take and leads to no immediate secondary depression.

As the coffee wakes up the brain, so to speak, it also stirs up the spinal cord and peripheral reflexes. The man after this cerebral stimulation then smokes a good deal, which soothes the spinal irritation, and he then, having coffee plus tobacco, can do an immense amount of brain work. If this is kept up long, sooner or later, depending upon the individual endurance, a nervous, irritable condition supervenes, with insomnia, anorexia, loss of weight, tremulous tongue, perhaps some trembling of the hands, with a pale or yellowish skin due to disturbed liver function and perhaps some kidney or bladder irritability, with probably a nicotine heart. We have then a neurasthenic to treat, which means to stop all coffee, tea, and tobacco, give mental rest, change of air and scene, and the institution of every legitimate means or subterfuge to produce sleep.

The contra-indications to the use of caffeine are palpitation, irritable heart, high blood pressure, cerebral or spinal inflammations or irritations, insomnia, neurasthenia, and acute genito-urinary inflammations.

Now, a word as to the much misused cardiac stimulant alcohol. There is a considerable difference of opinion to-day as to the value of alcohol as a cardiac stimulant. Its action on the vascular system, however, is marked and positive. The irritation which strong alcohol in any form causes on the mucous membrane of the throat, esophagus and stomach acts reflexly through the medulla to cause vasoconstriction, and hence a rise of blood-pressure, and increased blood-pressure is always a stimulant to the heart. After alcohol is absorbed into the blood, where it circulates as alcohol, it cannot, in my opinion, by its physiological action on the vasomotor centers, on the blood-vessels, and the heart, ever be a stimulant, although as its secondary effect is to dilate the blood-paths, this very fact of increasing the peripheral circulation may better the condition of the heart. Through, then, the irritant impact of the alcohol on the mucous membrane the blood-pressure is first raised, but when it is absorbed the blood-vessels dilate, especially those on the surface of the body. This relieves any spasmodic contraction of the peripheral blood-vessels, whether from fear, from pain, or from chilling of the body, and this equalization of the circulation relieves any internal congestion that may be present. By this widening of the blood paths, provided no condition of shock is present, alcohol will relieve the laboring of a weakened heart. If too large doses of alcohol are given, this vasodilatation goes on to

partial paralysis of the blood-vessels, and a weak action of the heart from this cause alone will occur. Hence in shock where the blood-vessels are widely dilated or perhaps paralyzed either from chloroform or ether narcosis, or from morphine narcosis, alcohol, except for its primary stimulant action in small doses, would do harm and is contra-indicated.

The exact action of alcohol on the heart itself is not proved beyond a reasonable doubt. Certain it is that overdoses of alcohol after absorption are depressant to the heart muscle, to the muscle fibers of the blood-vessel walls, and to the vasomotor center in the medulla. In sudden cardiac failure the reviving action of alcohol seems to me to be due entirely to the reflex stimulation of the mucous membrane of the throat and stomach. By this stimulation we cause an increased cardiac frequency and a slightly raised blood-pressure from the contraction of the arterioles due to the reflex action on the medulla. This action, which occurs before much alcohol has been absorbed, may tide over the condition of acute cardiac failure, and if not much alcohol has been given, there will be no future cardiac or vascular depression. If too much alcohol has been administered and absorbed the result will be to increase the previous depression unless more fresh alcohol is given for its continued stimulant reflex effect. If the previous doses are not too large and are hence rapidly burned or eliminated the effect will be continued stimulation and not depression. In conditions of high temperature where the heart is very rapid from the stimulation of the fever, from the irritation of the toxins in the blood and from nervous irritability, alcohol, by quieting the nervous system, dilating the peripheral blood-vessels, and possibly combating the toxins in the blood, generally reduces the temperature and slows the pulse. If the dose is properly regulated this action will be found to be continuous for good. Too large doses or too frequent administration of alcohol may do one of two things; either stimulate the brain and cause more excitation, increasing the temperature by increasing muscular irritability and restlessness, and causing enough of its local reflex irritation to make the pulse bounding and full, or, if it is too rapidly absorbed, it will give the symptoms of alcoholic depression on the circulatory system. Hence in acute cardiac failure to get the stimulant effect of alcohol it must be given concentrated, as exemplified by brandy, whisky, gin, rum and champagne, and in small doses. To keep up this stimulation, another dose must be given in from fifteen minutes to half an hour or an hour, depending upon the continuousness of the heart weakness, in order to repeat the stimulation of the irritation. As just stated, the dose should undoubtedly be small, as the future depression from the absorption would be less than it would from large doses. If the frequency of the dose is such that alcohol piles up in the system and more is given before the previous ingested amount has been burned or eliminated, to obtain stimulation it will be necessary to give larger and larger doses, first to overcome the depression caused by the previous alcohol, and to also cause the usual stimulation. As more and more alcohol is absorbed, whether from the stomach or from hypodermic injection, depression, vasomotor dilatation, cardiac weakness, and more or less paralysis of the nervous system are sure to follow. Hence to combat continuous or persistent cardiac failure or depression alcohol is the poorest stimulant we can use, and if much is given we are poisoning the system and adding depression to depression that is already there, and the treatment is vicious.

In conditions of prolonged fever where alcohol is given no more frequently for any length of time than every three hours, one dose is probably eliminated or burned before the next one is given, and we get the primary stimulation plus the dilatation of the peripheral vessels, which equalizes the circulation and reduces the temperature.

Let me parenthetically say that I have often obtained the same good circulatory results in sthenic fever from small doses of nitroglycerin that I have obtained with alcohol.

In serious feverish conditions undoubtedly the narcotic effect of alcohol in quieting the patient who is highly alert to his danger, may be of distinct advantage, as mental worry and anxiety are great disturbers of the heart and circulation, and should be overcome by any legitimate means.

A STUDY OF GOOD RESULTS IN HIP DISEASE.*

BY V. P. GIBNEY, M.D.,
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A MEETING of the Academy in a Summer month precludes the introduction of a scientific paper, and the few fellows who have acquired a habit of attending are entitled to a consideration which the writer feels in duty bound to extend. The selection of a title, therefore, carries with it an effort to make a practical talk on some questions that are always appearing to the body politic in medical circles.

A question that confronts the doctor in the early stage of hip disease is, Can a "good result" be obtained? An experience of more than a quarter of a century in dealing with diseases of the bones and joints ought to enable the possessor of such an experience to define "good results." The best result that any form of treatment can secure is perfect restoration of function without shortening or deformity. Such a result is so rare that the term "good" has been accepted as satisfactory. Why the "best" is so rare it may be well to set clearly before this audience the meaning of "hip disease." A technical definition is not attempted, for this will not give one a clear idea of the malady under discussion. Practitioners are too prone to rely on certain stereotyped signs for a diagnosis. For example, if one finds on examination of a child in whom hip disease is suspected a limp more or

* Read before the New York Academy of Medicine, June 4, 1903.

less pronounced, a loss of contour in the nates of the affected side, an inability to flex, to extend, to abduct, and to adduct to the normal limit without pain or resistance, the conclusion is often reached without analyzing the finer points in the clinical and personal histories of the case. Now, should all the aforesaid signs be present, a certain consideration should be given to the pathology, the etiology, and, above all, to the first appearance with the date of symptoms. There are so many lesions, quite simple in character, that impair the functions of the hip, sometimes to the point of immobilization, that mere signs of themselves cannot be accepted as absolutely diagnostic.

The hip disease under discussion this evening is, pathologically speaking, a tuberculous osteitis of the neck, or head, or the acetabulum, one or all. The lesion has its starting point in one or more of the centers of development, and long before the wonderful discovery of Roentgen careful diagnostication was reasonably accurate in locating these initial lesions. The X-ray is shedding light on these lesions and promises great assistance in the recognition of these inflammatory foci. However good a radiograph may be, it is requisite that a certain facility in interpretation is to be attained before one can say definitely whether a lesion exists or not. It may be taken for granted, therefore, that the radiograph is, up to the present time, only an aid in diagnosis.

From an etiological standpoint it must be remembered that diseases are not inherited, but that the predisposition and vital resistance are inherited. So that if an ancestor, near or remote, has had hip disease, it does not follow, by any means, that the patient in question has hip disease. Our consideration only must be accorded the vital resistance.

The clinical history is a very important factor in estimating a diagnosis. There may be at the outset an acute exacerbation, yet this is the exception. A slight limp is the first sign observed, pain in the knee only occasional, complaint when an extra function is called into play, such as pulling on the shoe and stocking and going up or down stairs, a stiffness in the morning gradually wearing off toward midday, more pain in sleep if the patient has been specially active during the day, screaming pains at night and usually without waking, a general disinclination to use the limb, and above all, the persistence of the limp. Now, all the foregoing symptoms usually precede the exacerbation that calls for medical or surgical advice some two or three months. The parents are satisfied when a neighbor suggests growing pains, or rheumatism, or malaria. Given now such a history, the test of function ought to enable one to make a diagnosis of the hip disease, the result of which we are now considering.

In the interest of the patient and the father and the mother, it must be urged, "Make a careful test of all the functions." Do not be satisfied with anything short of an examination of the patient nude and on a table or floor, without a mattress. Remember, too, that a test of the functions of the sound hip are necessary as preliminary. Comparisons can then be made satisfactorily and the meaning of hip disease now clearly understood.

Pardon, please, the mere mention of a few of the lesions that are often called hip disease, and no attempt will be made to enter into a differential diagnosis. There comes to mind at this moment a contusion of the hip, clearly traumatic, a periarthritis, either phlegmonous or rheumatic or traumatic, involving the muscular tissue or the capsule and ligaments, a coxa vara, rachitic or traumatic, a congential dislocation of the hip—easy of recognition if one will spend a little time on the case, a trauma involving the femoral neck or the periosteum of the shaft near the trochanter-major, a psoas abscess, a perityphlitis, a poliomyelitis, a neurosis dependent on an irritable spine or a toxemia or a hysterical hip.

In this prolonged definition with examples it may be claimed that "good results" are being crowded to the rear. The writer never has any apology to offer for time occupied in emphasizing points in early diagnosis and pathology. He regrets to say that the knowledge displayed by the average practitioner on these two topics is as yet lamentably deficient.

A good result as understood by the parent is a life saved, often a limb, yet an ease in getting about unassisted by splint, crutch or cane. Over an inch shortening is not regarded with complaisance. An inch or less is satisfactory. It usually depends on the point of view and the coaching of the surgeon in charge. Comparisons are not odious, for always a deformity that might have been more hideous, a disability that might have been more disabling can be pointed out, and the situation is accepted.

A good result from the practitioner's standpoint is arrest or termination of the disease, regardless of the position in which the limb is left. Anchylosis is rather courted, and if a stable, firm union is secured, it is believed that the patient will be free from any late exacerbations and locomotion will not be seriously impaired. The claim is often made, too, that a cure with a flexion deformity enables one to sit more comfortably and to dress oneself with more ease than if the anchylosis existed without deformity. Here again the point of view is to be considered. For one whose vocation is to be a sedentary one there is no question but that an angle, say, of from 135 to 150 degrees fixation is better, but where one's vocation takes him out of doors and does not interfere with all kinds of sport, the position should be straight, that is, anchylosis, if anchylosis must exist, with either flexion or adduction deformity.

Studying further this result, which may be called the medical result, one finds the patient as puberty approaches sometimes dissatisfied with the existing deformity, and relief is sought at the hands of the general surgeon. An osteotomy, either simple or cuneiform, is done and the limb is placed in what is honestly believed to be a good position, that is, straight with the axis of the body. It matters little what means are em-

ployed for fixation, disappointment comes on removing the appliance, for the deformity has not been fully corrected. It is within the observation of the writer to have seen many, many instances of such failure. And here again comes the philosophical assurance that this is much the best result one could expect. All the time one finds apologies for results in hip disease, and the profession has not awakened fully to the belief that better results can be obtained than statistics already furnish.

What does the orthopedic surgeon regard as a good result? Here again we lack unanimity. One whom the lay press has placed at the pinnacle has claimed that anchylosis without deformity is the best we can expect. Plaster-of-Paris is used to allay irritation and encourage anchylosis. The writer of this paper has seen a few results from prolonged use of plaster-of-Paris supplemented by axillary crutches, but he has not seen many results after the prolonged use of plaster-of-Paris as a fixation dressing associated with the use of the limb. It is his impression that statistics of results in this country would be hard to obtain.

Surgeons who claim that early excision yields good results are not able to furnish the proof. If the disease on section is found extensive, too much of the bony tissue must be sacrificed, and not infrequently a flail joint is the result. Early excision is not popular in this country because of the mortality and of unstable limbs.

Among orthopedic surgeons whose practice is not confined to splints, there is a growing tendency to remove by small aseptic operations the foci of disease demonstrated by the radiograph. Some find it advantageous to evacuate small collections of pus by means of the scalpel when the needle will not suffice. All of these operations, however, should be followed by protection apparatus. It has been abundantly proven that the best results are obtained by the early use of splints that immobilize the joint. Such appliances, to be efficient, must be long continued, irrespective of that bugbear of the laity and some practitioners, muscular atrophy. Among the best informed of orthopedic surgeons the results attained over a quarter of a century ago by the late Charles Fayette Taylor have not been surpassed, and this pioneer claimed that muscular atrophy was a thing to be courted.

The good results which are acceptable to men in our branch of surgery are results with the minimum amount of shortening, without deformity, and with the maximum range of motion. Our aim however, is to get not "good results," but "best results," and the more we can approach perfect function the better we are satisfied. Results after all must be studied on a basis of the stage in which well-recognized methods of treatment are begun. The keen diagnostician will recognize the lesion before the deformity arises and at an early stage, while the poor diagnostician will fail to recognize hip disease until the mother of the child has already made the diagnosis herself. Then the second stage, that of deformity, will have been reached and the advantages of early protection are lost. The tardy recognition of the value of instruction in orthopedic surgery by the medical schools throughout the country is largely responsible for the destruction of hip joints and the hopelessness of restoring functions to points thus impaired. And yet we have reason to hope for better results because nearly all the large and well-equipped schools of medicine have within the last decade established such chairs, and the younger practitioners who will ere long make their influence felt will thus increase the number of those who get efficient treatment before the second and third stages are reached.

The results ought to be good and many cures ought to be obtained, cures that have no trace of deformity or impairment of function. Where treatment is delayed until the bacilli have already played sad havoc with the head and neck of the femur, fair results may be obtained by close attention to details and by intelligent home cooperation. Here one must be posted on the damage to tissue an abscess can cause, and steps will naturally be taken to curb its virility. Occasionally a fine result can be secured, but this can hardly be expected.

In the third stage we must be content with correcting deformity and eradicating necrotic areas and sinuses. Results that will satisfy can be secured if we maintain the best position of the limb. If by faulty technic we fail to hold what we get, then do not hesitate to repeat efforts at correction, not resting satisfied until the maximum benefit has been secured as a lasting result.

CHRONIC NEPHRITIS WITHOUT ALBUMINURIA.

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THE writings of Rayer, Dieulafoy, Lancereaux, Lepine, Stewart, Wilks, Mahomed, Purdy, Saunby, and other authorities have made us familiar with the fact that albuminuria may be temporarily or mainly absent from the urine during nephritis, especially during chronic interstitial nephritis. While this fact is now common knowledge it is not so fully appreciated that nephritis may progress to an immediately dangerous stage, with continued absence of albumin from the urine. It is worth noticing, especially, that often, notwithstanding that the urine is absolutely free from albumin, cardiovascular developments may be far advanced and the fatal issue not far distant. Even symptoms, ordinarily included among the terminal developments of chronic nephritis, may prevail without the urine giving the albuminous reaction. Thus albuminuric retinitis, chronic uremia, or cardiac incompensation may become established and presage an early termination of the case without the presence of albuminuria.

The absence of albumin is not confined to chronic interstitial nephritis, but has occasionally,

although more rarely, been noted in chronic parenchymatous nephritis and acute nephritis, even of the postscarlatinal type.

I have chosen from a series of cases that have fallen within my experience the following examples, which I shall briefly relate, as illustrating how extreme may be the development of chronic nephritis, without the occurrence of albuminuria, appreciable by the methods in use. In testing for albumin, I have, in every analysis, used several tests, in order that my results might be devoid of the error, so easily possible when but one method is employed. I have eschewed the use of the extremely delicate tests, such as the potassiomercuric iodide, picric acid and trichloracetic acid, having long since grown to distrust them as being oversensitive and liable to error, with peptone-albumose, nucleo-albumin and alkaloids. The method pursued consists in the successive application of the potassium-ferrocyanide, Heller's nitric-acid, and the heat-with-acetic-acid tests.

Case I.—Young man, thirty years of age, of excellent habits and unimpeachable heredity was referred to me by Dr. L. E. Schwarz, of this city. Patient's previous history had been uneventful, save for a severe attack of the grip, lasting one month, at the age of twenty. Several less severe influenzal attacks have occurred since that date. Visual disturbances had led him to consult Dr. Schwarz, who, upon examination, found a typical neuroretinitis of albuminuric type of the left eye. There was a slight blurring of vision of upper and lower temporal fields, but central vision was never disturbed. The papilla was swollen, opaque and reddish, with all outlines lost; infiltration, opacity and swelling of retina marked. Hemorrhages were present, but neither numerous nor large, and were situated in the upper and lower nasal and temporal portions of fundus, and within three diameters of the disk. The large arterial elements were entirely obscured at points, numerous white plaques or foci of degeneration showed in the macular region, especially downward and inward, but were without regular arrangement. I am indebted to Dr. Schwarz for these details of the retinal condition. The patient displayed an entire absence of symptoms of ill health, except some dyspnea and slight precordial uneasiness upon exertion. He was habitually constipated. The prostate was found moderately enlarged, although not tender.

Physical examination revealed distinct but moderate cardiac hypertrophy, marked arterial fibrosis and tension, and the urine was entirely free from morbid characteristics, except for the presence of hyaline casts and reduction of urinary solids, below the normal average. Under treatment the retinal condition improved and the urea excretion increased, from a daily average total of 350 grains to 450 grains. In June, 1902, it is interesting to note, patient suffered an attack of primary labyrinthine vertigo (Menier's disease), no doubt due to hemorrhage into the semicircular canals of the right ear. Hearing on that side still remains markedly deficient. Not a single one of the 18 twenty-four-hour specimens of urine examined, during the twenty-eight months of my observation of this case, revealed the slightest trace of albumin. Hyaline casts in very sparse numbers have invariably been disclosed by careful microscopic examination.

Case II.—Woman, fifty-two years of age, of neuropathic heredity, never robust and the subject of periodic hemicrania. The clinical history of this patient's nephritis was ushered in by uremic convulsions, suddenly developing, after a few day's indisposition, from functional digestive disturbance accompanied by dizziness and headache. It was only with the greatest difficulty that patient was rescued from the severe toxemia. She lived for three and a half years, at the end of which period a second, and this time fatal, uremic development terminated the case. During this interval many single and twenty-four-hour specimens were examined, but at no time was albumin found in the urine. Casts hyaline in character were constantly to be found in the urinary sediment, although in very small numbers. Cardiovascular changes were well developed and troublesome nocturnal polyuria greatly disturbed the patient's rest. The urine frequently reached as high as 100 ounces in the twenty-four hours and was of uniform low specific gravity. The total urea and other urinary solids were greatly reduced, and it was only by the most careful supervision of the patient's habits and persistent stimulation of the emunctories that uremia was for so long averted.

Case III.—Woman, fifty-eight years of age, weighing 110 pounds (normal weight), first consulted the writer in May, 1901, complaining of dizziness, frequent blurring of sight, slight edema of feet and frequent nocturnal urination. No dyspnea or palpitation present. Physical examination revealed a hypertrophied heart, well developed vascular sclerosis and distinct arterial tension, which was readily appreciated by the examining finger and beautifully expressed in the sphygmogram. Heart sounds were clear and booming with marked accentuation of the second aortic. Three months after first consultation, cardiac dilatation supervened, and ever since that time a distinct blowing mitral systolic murmur has been audible, slight dependent edema has been constantly present and dyspnea of effort has prevailed. Retinal changes, present in their incipiency, progressed at the time of the cardiac incompetency, and a typical bilateral albuminuric retinitis became established with almost entire loss of vision. During the eighteen months which have elapsed since the time of these developments the patient has been under constant observation. The visual acuity has fluctuated with the general systemic condition and the circulatory integrity has been fairly maintained by the measures employed. Uremic manifestations have developed from time to time, and the patient is at present under daily attention for a serious uremic state. The interesting feature of this case is the urinary condition. In all 55 twenty-four-hour collections

of urine have been submitted to careful testing. In only three of these specimens was albumin found in demonstrable amount and this albuminuria was minimal and coincided with circulatory disturbances. The specific gravity and urea have invariably ranged low, the latter seldom rising above 200 grains in the twenty-four hours. Casts of hyaline and light granular character, but in small numbers, were constantly revealed by microscopical examination.

Latency of symptoms is a characteristic which so frequently marks the form of nephritis, known as primary chronic nephritis or interstitial nephritis, that it may almost be designated its most distinguishing feature. This lack of emphasis holds more particularly with reference to the urinary signs, but is also, although to a less extent, remarked in the general physical manifestations, particularly their subjective expression, and it prevails more or less throughout the entire course of the disease. The cases reported certainly demonstrate that latency of symptoms is not a point of absolute distinction between the early and the advanced stages, or between the slight and the severe forms of the malady. Seldom in any given case will one have at hand an unbroken association of symptoms, urinary and physical, from which to construct the diagnosis. The discrepancy between the clinical symptoms and the renal damage is often extreme and at autopsy it may seem impossible to connect the atrophied degenerated kidneys with the urine, which has been the outward expression of the disease during life. It is by no means uncommon for lesions to exist in a relatively advanced state without the patient consciously suffering from any marked disturbance of health. So much is this the rule that many, if not the majority, of these cases are revealed accidentally in persons undergoing medical examination for reasons other than the relief of symptoms, produced by the disorder, and this, even at a time when the organic degeneration has progressed to such a point as to preclude the possibility of a long survival. As a rule the diagnosis must be made during the early stages, from physical signs, rather than from subjective symptoms. When symptoms arise the disease has already existed for a considerable period, and the renal lesion is far advanced. Such symptoms as exist during the early progress of the disease represent such a slight departure from the normal that they are rarely made the subject for complaint by the patient, and may only be elicited after direct and pointed interrogation. They most commonly consist of some degree of polyuria and evidences of circulatory disturbance under strain. Polyuria is the most constant and, in the majority of cases, the only urinary symptom remarked during this period. It does not become established until cardiac hypertrophy has taken place and ever after and until compensation fails, and the blood-pressure in this way becomes lowered, it remains a constant feature of the clinical picture. In those rare cases in which, for any reason, cardiac compensation fails to become established, polyuria will be absent. Rarely is this symptom made the subject for complaint upon the part of the patient, who generally regards it as a favorable sign that urine is passed freely. The distinctive feature of the polyuria of this form of nephritis is its nocturnal character. Almost invariably the amount of night urine greatly exceeds the amount of the day's output. In well-developed cases I have seen the night urine amount to four times that passed during the day. The patient's rest is disturbed by the necessity for urination; which this excess imposes, and he consequently may rise a number of times to void urine. Various explanations have been advanced to account for this curious phenomenon, but I believe the true one to be the increase in vascular pressure, following recumbency. We often see this increased pressure manifested in other interesting ways in this disease. To illustrate, I cannot do better than to relate the following case:

Case IV.—Large, fleshy woman, fifty-two years of age, was operated for uterine fibroid in 1894, at which time a diagnosis of Bright's disease was made. Writer was consulted in February, 1901. Subjective symptoms were entirely nocturnal and of such a character as to make patient dread the approach of bedtime. Lying down was the signal for great mental restlessness, which frequently, for hours, precluded the possibility of sleep. Occipital headache and vertigo often came on shortly after retiring for the night, and backache of purely nocturnal development was often very troublesome. An additional source of disturbance was the necessity for urinating two or three times each night. As the result of these combined deterrents only three or four hours' sleep could be obtained each night.

Physical examination revealed a forcible cardiac apex, six inches to the left of the midsternum. The apical region was tender to palpation. Frank arterial tension and sclerosis were present. Not to go farther into the details of this case, I will merely add that its progress has been typical and eventful, cardiac dilatation having supervened this winter. The urine has been carefully observed in a routine way. Casts have been a constant feature of the urinary sediment in every specimen examined. In all 13 samples, each of them a twenty-four-hour collection, have been analyzed. Only two of these specimens gave any reaction for albumin and then a trace only. This minimal albuminuria occurred during the circulatory crisis of the past winter.

Almost invariably the normal healthy adult experiences no need for emptying the bladder during the average hours of sleep, unless he has indulged in some unusual excess of fluids immediately before retiring. The exceptions to this rule are, I believe, rare. Certain affections of the lower urinary tract, the urethra, bladder, prostate, occasionally through irritation or abridgement of the containing power of the bladder, will cause nocturnal urination. Certain systemic causes, such as nervous hydruria, diabetes, excessive acidity of the urine, pyelitis, calculous disease, etc., also

bring about this result. Excluding these causes, which result in a more or less sudden onset of this symptom and are temporary in their action, the great majority of instances in which this habit becomes established, are cases of chronic nephritis. It is necessary, before according weight to this symptom, to establish the fact that it has not always been the habit of the patient, for in rare instances such may be the case. As a rule the onset of the symptom is gradual and by such easy stages that it insensibly grows into a habit, without awakening any concern in the patient's mind.

Among the earliest manifestations of chronic interstitial nephritis are certain symptoms arising from the cardiovascular changes which are so constantly associated with this disease. The changes comprise widespread arteriocapillary fibrosis and cardiac hypertrophy. They develop *pari passu* with the renal change and go back as far as we may, so soon as the disease is demonstrable, the pulse tension is high and the artery thickened. The accessibility of the circulatory system to direct examination enables one to consult the heart and arteries for diagnostic data at a time when the urinary condition is so obscure as to leave us in great doubt. The changes in the arteries are widespread, and generally quite early in the disease become appreciable to the senses, in the well-known, stiff, tense vessel and hypertrophied heart of arteriosclerosis. As a general rule, there are only two forms of widespread arterial change recognized, viz., atheroma and that connected with chronic nephritis. Care must be taken, however, to exclude alcohol and syphilis, since both are capable of producing arteriosclerosis and myocardial changes. When this condition is met with in the prime of life, it should direct attention to the kidneys. Certain subjective manifestations soon result from this altered vascular state. The earliest symptom produced is a slight dyspnea of effort. Associated with cough, as it frequently is, the patient may suspect asthma, and seek advice for relief of the respiratory distress. Auscultation of the lungs under these circumstances will reveal nothing, and the contrast between the negative pulmonary findings and the dyspnea is suggestive. Palpitation and a sense of precordial fulness are frequently complained of. Certain obscure sensory disturbances of vasomotor origin may be the only indications present, as in the following case:

Case V.—Blacksmith, age thirty-four years and of 182 pounds weight. Patient temperate. but with history of past excesses. Syphilis denied and no stigmata present. Patient complains of sense of coldness of lower extremities from the knees down (cryesthesia). On close questioning confesses to recent slight dyspnea and precordial distress upon severe exertion. Reflexes normal, no disturbance of special sense impressions, sexual power unaltered, locomotion good. Physical examination reveals distinct arteriosclerosis and the cardiac apex diffuse and forcible in the fifth interspace, 5 inches from midsternum. Aortic second sound much accentuated, prostate somewhat fibrous, enlarged and tender, urine contains trace of albumin and numerous hyaline casts.

The urinary changes in the early stages of chronic interstitial nephritis are, as we have seen, inconstant and unreliable, as a means of estimating the extent of the renal dystrophy. Associated with the polyuria, already referred to, a lowered specific gravity is usually met with. The diminished density is no doubt largely due to dilution of the urine, brought about by the polyuria, but must not be entirely attributed to that cause. There is an actual deficiency of urinary solids, owing to renal inadequacy. If from any cause, such as fever, excessive sweating, diarrhea, the urine becomes reduced in amount, there is not that proportionate increase in the specific gravity which is characteristic of normal urine. Careful estimation of the urea in the twenty-four-hour urine, by means of a reliable method, will almost invariably reveal some reduction below the normal average.

Albuminuria, the classic sign of nephritis of whatsoever character, cannot be relied upon as an indication in chronic interstitial nephritis. It has been a debated question whether albumin was not sometimes totally absent throughout the disease. There can be no doubt that it may frequently be altogether absent during the early stages, that in other cases it may be absent for long periods of time or until the disease enters the final stage, and that in certain other cases the stage of the disease seems to have little influence in causing albuminuria, the urine apparently remaining free from that body so long as no intercurrent disturbance, apart from the disease, arises to cause it to appear. As the expression of a personal opinion, I would say that in many cases where albumin is apparently absent, it is really actually present, though in minimal amounts only, and these obliterated so far as chemical demonstration by the methods in vogue is concerned, by the dilution of the urine through polyuria.

In such cases its occasional transitory appearance in traces coincides with temporary concentration of urine from physiological or pathological causes. I would further express the conviction that rarely albumin may be absent during the entire course of the disease, in cases of purely cirrhotic type, and only appear in obedience to grave changes in blood pressure, brought about by circulatory causes, or as the result of some intercurrent trouble, apart from the original morbid process.

The albuminuria of chronic interstitial nephritis, even when present, is very irregular, depending upon various physiological factors, such as exercise, character of food, etc., and often at certain times of the day the urine may be free from albumin, although containing it at other times. One is not justified, therefore, in pronouncing albumin to be absent unless a number of samples, taken at different times of the day, have been examined, or better still, a twenty-four-hour collection, submitted to testing.

Without going into the matter further, it may be claimed that the presence of albumin in the

urine in this disease is uncertain, and that it consequently is but a very unreliable diagnostic guide. When present, associated with physical signs and other urinary indications, it serves to complete the diagnosis, but if absent, no contrary inference is justifiable, and the diagnosis must be constructed without its aid. Much more reliable evidence of renal change is the lowered excretion of urea, which may exist months or years before the appearance of albumin, and especially important is the presence of tube casts in the urinary sediment. Casts are undoubtedly present with greater constancy in contracted kidney than is albumin, and in the diagnosis of this disease it may be stated that the morphological evidence afforded by the presence or absence of casts may be accorded more weight than the existence or non-existence of albumin in the urine. While in the main they are associated bodies, casts may be frequently met with when no albumin exists. Albumin without casts is more rare. It is perhaps not too extreme a view to say that chronic interstitial nephritis never exists as a clinically recognizable condition without the presence of casts in the urine. They are most frequently hyaline in character, and, as a rule, exist in small numbers, so much so as to be often difficult of discovery. Patient search for these bodies will, however, always reveal them. Their number bears no relation to the severity of the renal lesion; a desperate organic condition may coincide with casts so infrequent as to be with difficulty found, as in Case II here reported. I do not wish to be interpreted as asserting my belief in the pathognomonic value of casts in the diagnosis of this disease. Although helpful to it, renal diagnosis cannot be founded on casts alone. They do not necessarily mean nephritis, being frequently the product of irritation of the kidneys, by toxic or other causes. I believe, nevertheless, that casts are invariably present when true organic lesions of the kidneys exist. The more purely interstitial the process, the less the tubes are involved in the chronic inflammatory changes the fewer will be the casts. The observations of Defendorf (*Yale Medical Journal*, December, 1902) are of interest, and I may be permitted a reference to them in view of the present tendency to regard hyaline casts as irritation products, not necessarily possessing pathological value, except in the presence of other urinary abnormalities. Especially have they come to be viewed with indifference in individuals beyond middle life, because of their frequency of occurrence. A series of 48 autopsies of cases in which urine examinations had been made some time previous to death showed that purely hyaline casts were present in 41 and chronic nephritis in 47 of the cases, permitting the inference that hyaline casts in these instances were distinctly an indication of organic change in the kidneys.

We have seen that the evidence of chronic interstitial nephritis during the early stage is of two kinds, symptomatic and physical, of which the former is uncertain and not greatly to be relied upon. The physical signs fall naturally into two classes, cardiovascular and renal (urinary). Of the latter, the most important in the general estimation of the profession is albuminuria. This symptom, in many cases, is repeatedly absent in all stages of the malady. Upon what, then, are we to rely for the diagnosis in these doubtful cases? Fortunately we have good recourse, which will undoubtedly suffice in most cases for a satisfactory conclusion. The evidence of cardiovascular changes, arterial tension and enlarged heart, with hyaline casts in the urine and a deficiency of organic urinary excretives, combine to form a symptomatic association which will suffice for a positive diagnosis.

CONCLUSIONS.

1. Latency of symptoms is so constant a characteristic of chronic interstitial nephritis as to almost constitute its most salient feature. This obscurity involves all manifestations (symptomatic, physical and urinary) and prevails throughout the entire course of the disease.

2. Latency of symptoms does not constitute a point of absolute distinction between the early and the advanced stages or between the mild and severe forms of the malady.

3. Symptoms are especially liable to be absent and urinary signs uncertain during the early stages of chronic interstitial nephritis, consequently the diagnosis during this period must generally be made from physical signs rather than from symptoms or urinary signs.

4. Albumin is absent from the urine of this form of nephritis with great frequency. It may frequently be absent during the early stages. It may occasionally be absent until the disease enters the final stages. It may rarely remain absent from the urine throughout the entire course of the disease, the urine remaining free from albumin so long as no intercurrent disturbance apart from the nephritis arises to cause it to appear. Albuminuria, therefore, constitutes a very unreliable diagnostic sign in this disease. When present, associated with physical signs and other urinary indications, it serves to complete the diagnosis, but if absent no contrary inference is justifiable, and the diagnosis must be considered without its aid.

5. More reliable evidence of renal change is diminution in the gross amount of urinary solids, and especially significant is the presence of casts.

6. Chronic interstitial nephritis never exists as a clinically recognizable condition without the presence of casts in the urine. Although renal diagnosis cannot be founded on casts alone, they constitute a corroborative sign of high clinical value, when associated with other indications.

7. The secondary circulatory changes following chronic interstitial nephritis are so constant and characteristic as to furnish, in most cases, sufficient ground for the recognition of the disease before reference is made to the urine. The inconstancy of the urinary symptoms places them in much the same diagnostic category in chronic in-

terstitial nephritis as that occupied by the murmur in valvular diseases of the heart. The diagnosis should be made, if possible, from the physical signs and symptoms, the urinary indications being regarded as corroborative rather than as essential evidence.

MEDICAL PROGRESS.

MEDICINE.

Roentgen Rays in the Early Diagnosis of Pulmonary Tuberculosis.—The aid which this measure may furnish in diagnosing the early stages of this disease is made the subject of a paper by W. H. B. BROOK and A. S. GREEN (English Quart. Med. Jour., Aug., 1903). They examined a large number of cases and in no single case where the physical signs pointed to disease have the rays failed to detect mischief. In some cases where the signs have been absent the rays have shown deposits in the lungs, and here physical signs have been subsequently detected. It is also shown that the extent of the disease is in some cases greater than the physician thinks. The progress and results of treatment can be watched with accuracy. The only fallacies may be caused by chalky deposits in the lungs, old healed cavities and thickened pleura, but here the history and the symptoms will help in forming a correct opinion.

Diagnosis of Renal Tuberculosis.—The wisdom of basing a diagnosis of renal tuberculosis upon the appearance in the urine of tubercle bacilli is questioned by P. BAZY (Trib. Méd., Aug. 8, 1903); as cases have been seen in which acid-resistant bacilli presenting all of the morphological and chromatic characteristics of Koch's bacilli have been found in the excreta of non-tuberculous subjects. Such a case came under his observation; a nephrectomy for tuberculosis of the kidney having been urgently advised by the attending surgeon. Though examination of the centrifugated urine revealed micro-organisms having the same appearance, staining qualities and resistance to decolorization by acids as tubercle bacilli, their injection into guinea-pigs failed to produce symptoms of tuberculosis; neither did autopsy, performed three months after the injection, reveal tuberculous lesions of any kind. Hence the author holds it to be the part of wisdom and prudence to prove the diagnosis of renal tuberculosis by such experimental injections, in cases in which these bacilli are found in the urine, before resorting to so radical a measure as nephrectomy.

Specific Gravity of the Blood and Hemoglobin Estimate in Yellow Fever.—Through a somewhat extended study of the condition of the blood in yellow fever, A. D. ALBERTINI (Rev. de Med. Trop., Vol. IV, No. 7) has found that though the hemoglobin is increased in this condition, the specific gravity varies without any relation to the amount of the former. In illustration of this characteristic he cites a case in which upon the second day the hemoglobin was 92 per cent. while the specific gravity was 1.055; and on the fifth day the specific gravity fell to 1.045, the hemoglobin remaining unchanged. In striking contrast to this condition is the parallelism between hemoglobin and specific gravity in malaria, as demonstrated by Plehn. This investigator also found that while the hemoglobin and specific gravity curve rise and fall together in malaria, in typhoid and dysentery hemoglobin does not change from the normal though the specific gravity is reduced. Albertini believes that a study of the blood's hemoglobin and specific gravity will lend valuable aid to the differentiation of yellow fever and other infectious diseases.

Leucocytosis Following Endovenous Injection of Bichloride.—In 15 individuals subjected to endovenous injections of corrosive sublimate, G. MEMMI (Gazz. Osped., Aug. 9, 1903) found there was an increase in the number of the leucocytes; in some of these cases the increase reaching from 2,000 to 5,000. This increase was to be seen, as a rule, from an hour and a half to two hours after the injection; reaching its maximum in four to six hours and diminishing from that time till the normal count was regained; this condition being usually reached within eighteen to twenty-four hours. The author believes that the beneficent influence of endovenous injection of bichloride is due to the increased defensive power of the organism, brought about by the leucocytosis it induces; rather than through its antiseptic influence.

Chylous and Chyliform Exudates.—After enumerating the varieties of milky exudates and reviewing the literature dealing with their pathogenesis, etc., A. CIPOLLINA (Gazz. Osped., Aug. 2, 1903) gives the case-history of a patient who some years after an attack of pleurisy came under treatment for what appeared to be influenza. In the course of examination a point was reached in the chest which gave the physical signs of fluid, presumably in the pleuritic cavity. Exploratory puncture revealed the existence of a milky exudate of the variety known as chyliform adipose, which, the author believes, had its origin in encapsulation of the effusion which had occurred some years previously; this effusion having subsequently undergone fatty and granular degeneration. Clinical experience, says the author, shows that milky exudates may be met with at any age and in a great variety of conditions; they, however, show a predilection for patients afflicted with malignant tumors and serious tuberculous lesions. Their symptomatology is that of all exudates, save that in chylous ascites there may be signs of peritoneal inflammation. Chylous ascites is very abundant and the fluid reaccumulates rapidly and repeatedly after puncture. The prognosis in this form of ascites is always grave.

Course of Diabetic Coma.—Coma, as the fatal issue of diabetes presents itself, is one of the most important symptoms of the disease, and has been observed as a terminal symptom frequently in severe cases of the affection in young persons. V. T. ORLOVSKY (Roussky Vratch, No. 30, 1903) observed 3 cases of diabetic coma, and finds that notwithstanding the introduction into the organism of considerable quantities of fluids hypodermatically and through clysmata, the amount of urine may become considerably diminished, while its specific gravity is but little lowered; the amount of sugar in the urine is at times increased, at other times diminished; though the daily total may at times diminish very considerably. Typical diabetic coma accompanied by air "hunger" may develop even in those patients in whose urine there had been no dextrose for some time, nor during the attack of coma; the latter was, however, observed in but one single case, in whom the disappearance of sugar in the urine for seven days previous to the attack the author ascribes to the extreme anemia which is usually accompanied in severe cases by a diminution in the amount of sugar in the urine, and sometimes by its entire disappearance, due evidently to disturbances of the alimentary functions, and smaller quantity of food ingested. The real nature of the coma as it presented itself, could only be defined from the observation of the course of the disease in the hospital, for the character of the urine during the attack furnished no positive indication of the presence of diabetes mellitus. Contrary to Naunyn,

the author observed a considerably slower and deeper respiration.

Diagnosis of Liver Abscess.—Until not so very long ago, the diagnosis of liver abscess was difficult and surgeons often waited until the abscess was very large or matastases had formed in the liver, before operating. D. SCHLAYER (Münch. med. Woch., Aug. 11, 1903) points out the importance of counting the white cells, by the absence of a leucocytosis he could rule out a number of cases of typhoid, malaria and nephropyelitis which closely simulated hepatic abscess. It is not proper to depend solely upon the number of leucocytes in deciding when to operate and the temperature and local symptoms must also be taken into account. After an abscess has been opened, all the symptoms generally disappear, so that the diagnosis of a second abscess may be impossible. Here again a leucocyte count proves invaluable. The white cells generally sink very slowly; if they remain high for several days and complications can be ruled out, it is probable that there is another focus in the liver. The temperature curve is less reliable, since even with complete evacuation of pus there may be quite a post-operative rise. Larger abscesses, requiring further operation will generally show more than 20,000 leucocytes; the smaller ones with 15,000 to 20,000 cells will often be absorbed spontaneously or become latent. An exacerbation of a dysentery or peritonitic processes may also be the cause of leucocytosis.

Fallacies of the Widal Reaction.—It is well-known that a small amount of bile in the blood will give a positive agglutination, even in patients not suffering from typhoid. F. KÖHLER (Münch. med. Woch., Aug. 11, 1903) could even bring about an artificial agglutination by ligating the common bile duct and by injecting taurocholic acid into the blood. There is no doubt that normal serum, and more often the serum of patients suffering from blood-diseases or from disturbances of the liver with jaundice, will cause clumping of typhoid bacilli in relatively high dilution. Human bile, even when heated for two hours at 60° C., and taurocholic acid, when added directly to a culture, will also agglutinate this but the phenomenon is by no means constant. A number of chemical substances such as salicylic acid, safranin, fuchsin, etc., will behave in the same way. A positive Widal is, therefore, not pathognomonic for typhoid; it may also be due to (1) disease of the liver with biliary stasis and bile in the blood; (2) chemical substances; (3) infection with the colon bacillus; (4) rarely other infections such as with the pneumococcus and meningococcus.

Phlegmonous Gastritis.—It is often difficult to ascertain the cause of gastric abscess and in the case observed by C. KLEINEBERGER (Münch. med. Woch., Aug. 4, 1903), iodide of potassium must be held responsible. A strong man of advanced years receives less than a dram of this drug within three days, for emphysema and chronic bronchitis. Soon severe iodine poisoning makes its appearance and with it, gastro-intestinal disturbances of a serious character followed by peritonitis, collapse and death. At autopsy, the abdomen was found filled with pus and the entire stomach wall was the seat of suppuration. The patient's previous history was negative, especially in reference to the intestinal tract. It follows that in cases of iodism some attention should be given the stomach and gastric lavage may often be indicated.

SURGERY.

Traumatic Hydronephrosis.—A boy, twelve years of age, was struck by a horse's hoof in the left side, and soon after began to vomit, and complained of extreme pain all over the abdomen; urine tinged with blood; the same on the next day. The abdomen was somewhat distended, and tender on pressure, especially on the left side. The patient improved so well in the course of a few days that he was discharged from the hospital to be readmitted, however, in two weeks, with still greater abdominal pain, and a marked swelling occupying the whole of the left costal space. The nature of the swelling—its fluid contents, definite boundaries not disturbed by moving the patient about—suggested to I. G. RYABOFF (Roussky Vratch, No. 30, 1903) a circumscribed collection of fluid in the abdominal cavity, a cyst developed immediately after a trauma with a tendency to rapid enlargement. The anamnestic data, especially as regards the admixture of blood in the urine, pointed to a possible hydronephrosis of the kidney. On performing a nephrotomy, and the fluid having been removed, a soft mass was felt by the examining finger which turned out to be clotted fibrin that closed up tightly the ureter and thus evidently served as the cause of the hydronephrosis. The pelvis was carefully cleaned, and the cut surfaces of the kidney were stitched to the edges of the skin wound, while a drainage tube was introduced into the pelvis connected with a vessel containing a solution of boracic acid. On the fourth day after the operation the stitches that united the edges of the incised kidney to the skin were removed, and a larger drainage tube introduced. During the first few days about 100 c.cm. of urine was excreted through the drainage tube, but by the sixth day this amount diminished to 40 c.cm. The drainage tube was removed on the ninth day, and the opening was soon closed. The first few days only 450 c.cm. of urine were excreted through the urethra, but this quantity soon increased up to 900 to 950 c.cm. The urine was at first turbid, with a considerable sediment, but without any admixture of blood; it gradually cleared up, until it finally became limpid. Temperature was normal all this time. The kidney gradually returned to its former natural size until, before the patient's discharge, it could hardly be palpated. Patient was discharged entirely cured. The rapid and certain success of the operation is due, according to the author, to the permeability of the ureter, which corroborates the view that the hydronephrosis was due to the closure of the ureter by the coagula of fibrin brought on by extravasated blood under the influence of the trauma.

New Operation for Caput Obstipum.—Dividing or extirpating the contracted sternocleidomastoid is generally not sufficient to cure a wry-neck, since the opposite muscle is elongated so much that it cannot carry out normal rotation, where the difference between the two muscles is more than four centimeters. L. WULLSTEIN (Centralbl. f. Chirurg., Aug. 15, 1903) shortens the stretched muscle by means of sutures placed beneath the entrance of the spinal accessory nerve. Simple resection is contra-indicated, since the lower portion of the muscle would lose its innervation. The bandage is generally kept on for twenty days, after which slight movements are permitted. The only objection to this method is that two skin incisions are necessary.

Operation for Femoral Hernia.—In elderly people and in cases of incarceration, J. GILLI (Centralbl. f. Chirurg., Aug. 8, 1903) modifies Lotheissen's method for femoral hernia as follows: The skin is incised parallel to Poupart's ligament, the lower flap of skin pulled downward and the sac dissected to the edge of the fossa ovalis. This is followed by splitting of the aponeurosis of the external oblique and displacement of Poupart's ligament. A Kocher's sound is then passed upward at the upper edge of the external hernial ring

between sac and plica falciformis, till it appears on the abdominal side of the inguinal ligament, corresponding to the inner hernial ring. Upon this sound the ligament and plica are divided transversely. After all spurting vessels are caught (such as an abnormal obturator artery or a large anastomotic vessel between obturator and inferior epigastric) the thickened fascia propria surrounding the neck is split, when the sac will be completely free. After this the hernia is reduced and the opening closed in the ordinary way. By this method the constricting ring is severed under complete control of the eyes and hemorrhages difficult to check are avoided. By completely unfolding the neck of the sac, the abdominal cavity can be opened above it and its contents tamponed off, before the sac itself is opened, thereby avoiding a peritonitis in strangulation. The operation can be performed under local anesthesia even in sensitive people.

An Aid to Narcosis in Ileus.—The question of narcosis in cases of intestinal obstruction and ileus has been attended with many difficulties, chief among which has been the danger of an aspiration pneumonia. Especially in the case of an ileus where operation may have to be undertaken without previous preparation, regurgitated materials may be inspirated even after the stomach has been washed out. The attempt has been made of leaving the stomach tube in situ during the anesthesia, but it was found that the gastric contents passed alongside as well as through it. In order to obviate this difficulty, an ingenious apparatus has been devised by W. KAUSCH (Berl. klin. Woch., August 17, 1903). It consists of a soft rubber stomach tube near the distal extremity of which is fastened a rubber balloon, which when dilated has a diameter of 7 cm. From this leads a thin rubber tube somewhat longer than the stomach tube, which is connected with a similar balloon. This contrivance is introduced into the stomach in the usual way before narcosis is begun, with the balloons collapsed. The latter are then inflated and a clamp placed on the tube beyond the second. The anesthesia is then continued, while sufficient traction is exerted on the affair to keep the inflated balloon at the cardia of the stomach. In three cases of ileus in which the author tried it, a lot of fecal material was discharged through the stomach tube but none alongside which could have possibly entered the larynx. Another advantage claimed for the contrivance is that the upper part of the gut may be cleared of its contents without making an opening, by merely squeezing the contained materials into the stomach, from which they can readily find their way out through the tube. A metal clamp, properly protected with rubber, is placed around the tubes where they come into contact with the teeth, so that compression from the latter is avoided.

Surgical Treatment of Trifacial Neuralgia.—A method of treatment which follows closely that of Durante and Thiersch and which combines nerve stretching and resection is thus described by G. BARONI (Gazz. Osped., Aug. 2, 1903). The trigeminal nerve is exposed for as great a length as possible and isolated. The nerve is then seized with pincers at the angle of the wound in the soft parts corresponding to the center of the nerve and gentle traction is exerted upon it. Gradually the nerve is seen to be stretched and drawn outward. It is again seized with the pincers near the angle of the wound and more energetic traction causes it to be severed some distance from the point at which it is held by the forceps. This same maneuver is repeated at the opposite angle of the wound, that is toward the peripheral portion of the nerve. In this manner a larger portion of the nerve is removed than could be accomplished by simple resection; for not only is that part accessible which is uncovered by the incision, but an additional portion is drawn out by the movements of traction and the section occurs nearer the ganglion. Furthermore, the beneficial effect of nerve stretching is attained by the same means through which the section is accomplished and simultaneously with it.

Murphy Button in Stomach and Gut Operations.—The interest in this subject remains unabated. In a leading article of almost 100 pages O. NEUWEILER (Archiv f. klin. Chirurgie, Bd. 69, Heft IV, 1903) gives a critical review of all recent literature concluding in this volume the able article of the previous issue. He concludes that perforation resulting from the use of the Murphy button is particularly prone to occur after union of the small gut following resection for incarcerated hernia; in certain gastro-enterostomies and particularly after circular iliocolostomies. In many cases the blame for the perforation lies in faulty technic or in the use of worthless buttons. In hernia, the cause of perforation lies more in the already existing infection than either in bad technic or faulty button. This is shown by the fact that union by suture yields no better result. This is, therefore, no just arraignment of the button principle. Before using a button the following conditions should be fulfilled: (1) The margins of the ring which are designed to hold together the serous surfaces on the male side and all marginal holes must not be sharp but evenly rounded off; (2) the opening between the cylinder and ring of the female side must be wide enough to admit a thick gut wall; (3) the cylinder of the female part must be somewhat shorter than that of the male or that a complete locking of the two parts may be possible; (4) the male cylinder, when the button is closely pressed together should not overreach, lest, with the fingers closely pressed over the openings, its margin may seriously wound the mucous membrane of the gut; (5) the strength of the spring must be such that the pressure will be absolutely continuous so that necrosis will occur early; (6) the size of the button must be in proper relation to the size of the gut. Touching on the technic of inserting the button he notes the following points: (*a*) The purse-string suture should not be placed too far from the edges of the gut lest a cuff result too large to be accommodated by the button; (*b*) Similarly this stitch shall not be placed too near the edge for fear of tearing out when the button is pressed together. Two to three mm. from the edge seem the best average distance; (*c*) In circular anastomoses care must always be taken that the stitch holds the mesentery close to the button so that at this point only serous surfaces shall be brought together; (*d*) Protruding mucous membrane should always be resected; (*e*) The closure of the button should not be accomplished by a single push but by several. The fingers should be so placed as not to wound the mucous membrane upon the margins of the lumen; (*f*) In most cases a protecting reinforcing line of suture should be used.

End to End Union of Arteries and Veins.—The literature of this interesting problem is not as yet very full. A valuable contribution to it has been made by GEORG JENSEN (Archiv f. klin. Chirurgie, Bd. 69, Heft IV, 1903) which won for him the gold medal at the University of Copenhagen. His most important conclusion is that in those cases in which union is sought to be established by the use of sutures alone, without the introduction upon the intima of any foreign body, thrombus formation is entirely dependent upon bacterial infection. His experiments were conducted entirely upon horses and goats. He sutured, as a rule, the veins and arteries of the neck. So far as infection went his

results were somewhat discouraging, he having found it very difficult to keep the horses infection-free. He has devised a method of suture which differs somewhat from that of Glück, Murphy and Payr. Upon a ligature of fine silk he threads two needles. As much as 2 cm. of the vessel may have been resected. He consumes but 1 mm. at the end of each segment of vessel in making his stitch. This is a great improvement on other technics. From without in, through all coats, he passes the needles on the proximal side, from within out, on the distal fragment, they are driven 1 mm. from the margin. He used in his primary operations from 12 to 14 of these U-shaped stitches. His most recent modification is simply to pass two such stitches and then complete the sewing of the invaginated parts with a circular stitch. He concludes that in the absence of infection there should be no thrombus formation nor invalidating narrowing of the vessel's lumen.

HISTOLOGY, PATHOLOGY AND BACTERIOLOGY.

Hemorrhagic Gastritis Due to a Laryngeal Pseudomembrane.—The specimen demonstrated by A. G. ELLIS (Proc. of the Path. Soc. of Phila., June, 1903) was removed from the body of a child seven months old who had stomatitis and pharyngitis and who died with signs of tuberculous meningitis. At the pylorus there was found a plug of soft material, consisting of fibrin. Removal was easily accomplished but where it had been in contact with the gastric mucosa, the latter was considerably eroded. That this pseudomembrane had been formed in the respiratory passages was proven by the presence of small islets of tissue containing ciliated epithelium. A large number of diphtheria bacilli were also found.

The Structural Changes of the Pancreas as Related to its Functional Condition in Normal and Spleenless Dogs.—The histological appearance of the secretory cells of the pancreas, according to G. FICHERA (Beiträge z. Path. Anat., Vol. 34, No. 1), shows in the different stages of digestion and in the fasting condition, the same changes in spleenless as in normal dogs. At the same time the tryptic zymogen is produced irrespective of the presence or absence of the spleen. The islands of Langerhans display in the different periods of digestion functional and morphological changes which are the same in normal and in spleenless dogs; the ablation of the spleen has, therefore, no influence upon the function of the islands. The epithelium of the pancreatic ducts is furnished with the power to secrete. The spleen produces, particularly during the period of digestion, an oxidizing ferment, which during this period is sent in large quantities into the circulation; from this as the result of certain changes in the epithelium of the pancreatic ducts, the ferment passes into their lumen. In the latter it exerts its activity, transforming the pancreatic zymogens and rendering possible the characteristic proteolytic properties of the pancreatic juice. Of extreme interest is the fact that in spleenless dogs the capacity of the epithelium of the pancreatic ducts to secrete is markedly disturbed. In splenectomized dogs the pancreatic juice has no effect on albuminoids, since the removal of the spleen has deprived the abovementioned secretion of every oxidizing capacity. The pancreatic juice is robbed of its most important and most specific constituent.

Mechanical Obstacles in the Intestines and the Excretion of Indican.—The observation made by Jaffe, that obstipation in the small intestine produces a marked increase in the excretion of indican, while a similar condition in the large intestine produces no such increase, is confirmed by A. ELLINGER and W. PRUTZ (Hoppe-Seyler's Zeitschrift, June 19, 1903). An increase of indican accompanying obstipation in the large intestine is to be attributed to an extension of this condition to the smaller gut. The authors believe that no precise diagnosis of the functional capacity or patency of the ileocecal valve is possible without an exact quantitative determination of the indican. The clinical symptoms of intestinal occlusion frequently come on acutely, although some obstacle may have been present in the intestinal canal for some time. It should be the province of clinical investigation to determine whether or not repeated measurements of the indican content would give early knowledge of an increasing stenosis in the gut, at a time when, without such determinations, the slight and uncertain symptoms would only warrant at best a supposition as to the real condition. The researches of the authors prove that the narrowing of small portions of the gut, at least in the dog, produces marked changes in the indican.

Soap as Disinfectant.—Green soap has only a slight disinfecting power, according to O. HELLER (Arch. f. Hyg., Vol. 47, No. 3). Combined with crystallized carbolic acid in the proportion of 1 : 3 it forms a solution at room-temperature and increases the disinfecting power of the acid. Typhoid germs are killed by a five-per-cent. solution of phenol, but if green soap is added, a four-per-cent. solution will have the same effect. Soapy solutions of cresol, such as lysol, therefore do not only permit a higher concentration of the relatively non-poisonous cresol, but also make it a better disinfectant. The real cause of this is not yet explained, but possibly a new compound is formed by the interaction of soap and cresol.

Syphilis in Apes.—The successful experiment of inoculating syphilis into a chimpanzee after many unsuccessful attempts with other members of the monkey family was reported to the Academy by ROUX and METCHNIKOFF (Gaz. med. de Paris, Aug. 8, 1903). Great bacteriological and therapeutical discoveries are expected from this achievement. Unfortunately large sums are necessary to carry out these experiments, since the chimpanzee is an animal very difficult to capture.

Tubercle Bacilli in Milk.—The preliminary report of W. RULLMANN's experiments upon the effect of prolonged heating at a low temperature upon the tubercle bacilli in milk is found in the Münch. med. Woch., Aug. 4, 1902. It may be stated conclusively that heating for half an hour up to 65° C. does not kill the germs for the inoculated guinea-pigs invariably became tuberculous, even when the milk was thoroughly shaken. Experiments showing the effects of an hour's heating are not yet concluded but it is certain that the milk does not suffer in taste or digestibility by this process.

Experimental Lead Colic.—It is impossible to obtain a clear idea of the pathological changes in the ganglion cells of the celiac plexus in lead colic from the studies hitherto published, so that M. MOSSE (Zeitsch f. klin. Med., Vol. 50, Nos. 1 and 2) repeated the experiments on rabbits with an organic salt of lead. Metallic lead was found deposited in the cells and certain pathological changes were noted, but these were also found when other substances which cause contraction of the gut (berberine) were injected. The lesions must therefore be looked upon as resulting from excessive intestinal contraction. They are not characteristic for lead and do not explain the abdominal symptoms.

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SPECTACULAR THERAPEUTICS.

THE world of music will probably never know what it lost in the failure of Richard Wagner to supply himself with a pair of American spectacles. This is all the more lamentable in view of the fact that the contributions of America to the art of music have been rather meager, and that if the great Baireuth composer had only used a pair of Yankee eye-glasses, we should have had some right in this country to claim a share in the evolution of his eternal harmonies.

This is now, of course, a vain regret; but if the world of music has lost something, the world of science has gained much; for we owe it to the lucid writings of an American ophthalmologist that genius need no longer be handicapped by the want of appropriate goggles. In fact, genius without its spectacles will probably be as rare hereafter as a day in June, for with the frightful examples before us not only of Wagner but also of Darwin, Huxley and Carlyle, it is safe to say that no man of genius will henceforth be allowed to appear in public with his eyes uncovered. We could no more tolerate it than the Mohammedan could allow his women to go unveiled. The public would probably arise as one man and exclaim to such a rash man of genius: "Remember Wagner, remember Darwin, remember Huxley, and get thee to an ophthalmologist!"

The disadvantages of this state of things may be that some upstarts, who wish to palm themselves off as men of genius, will take to wearing spectacles, and so try to impose upon the world. It might be difficult, in fact, for non-experts to distinguish the musical compositions and scientific monographs of such upstarts; the very fact that these pseudo-genii wore spectacles would be confusing. But we should probably be safe in relying upon the ophthalmologists to give us some test or sign by which we could distinguish the true from the false, for these eye-specialists would doubtless be called upon to examine many more eyes than ever, and if reasonable fees were secured by them, they might establish a critical bureau of their own to announce to the world what are the real and what are the spurious men of genius. We doubt not that it would be easy to select an American ophthalmologist who would be an admirable chief for such an ophthalmological bureau of universal criticism.

The possibilities of good that open before the mind's eye from having all our men of genius wear spectacles are innumerable, and vastly greater than we have time or space to depict. What would not evolution have been by this time if Darwin had only worn specs? Is it too much to claim that he might have discovered the missing link? To what sublimity of style would not Carlyle's scolding have mounted if only he had had a pair of American eye-glasses that were warranted not to fall off his nose? Is it too much to suppose that even Froude, when he wrote the biography of the sage of Chelsea, might have discovered the exact form of insanity from which Mrs. Carlyle suffered, because her husband had asthenopia? What would not Huxley have accomplished with the bench of Anglican bishops if he could have had a better shot at them through a pair of Philadelphia spectacles? Is it too much to believe that he would have turned them all into agnostics, to the lasting satisfaction of himself and the scientific world? What would not society have gained if Wagner could have corrected the acoustics of his presbyopia with a pair of ten dollar lenses with gold rims? Is it too much to suppose that his audiences might get home in time to go to bed before half-past midnight? These are but few—very, very few—of the unspeakable advantages that would have accrued from attending to the refraction of refractory men of genius.

For ophthalmology the gains from this discovery will be ever greater than for the world at large. We do not mean the pecuniary gains, for, of course, these do not enter into consideration; but we mean the elevation of that specialty from being a mere branch of the science of medicine to the supreme height of being an arbiter of the productions of genius and an adjuster of spectacles to the nose of genius itself. This is indeed a destiny.

TUBERCULOSIS IN MAN AND IN ANIMALS.

THE widely advertised pronouncement of Koch while in England a few years ago, as to the difference between human and bovine tuberculosis, excited scientific interest all over the world, and caused the foundation of a special Investigation Commission attached to the Berlin Sanitary Bureau. The Commission was greatly assisted in its laudable work by the German authorities, and the results of its labors have been embodied in a report presented the other day by its chief, Prof. Kossel, before the Berlin Medical Society.

The communication treated, first, of the results obtained by the subcutaneous injection of tuberculous virus, derived from pigs and cattle, into cattle. In order to avoid the possibility of mixed infection a pure bouillon culture was employed instead of the matter directly from the infected animal. The site of the inoculation swelled perceptibly, attaining in the course of a few weeks the size of one's palm; on the eighth to tenth day the nearest lymphatic glands became involved, and in many instances attained the size of a child's head. Fever was observed the eighth day after injection. On autopsy the contents of these glands were found to consist of cheesy matter, while the rest of the body contained abundant miliary tubercles.

The experiments with human virus in the form of cultures made from sputum and pulmonary tissue, gave the following results: Both the swelling at the site of inoculation, and the enlargement of the adjacent lymphatic glands were considerably smaller than in the former experiments. At the autopsy of animals four months after inoculation, living bacilli could be detected at the site of the injection, while the contents of the glands consisted of small, circumscribed foci of cheesy matter; no miliary tubercles were found anywhere on the body. Inoculations were also made with bacilli from tuberculous bones, tuberculous cervical glands, and from one case of tuberculosis of the genito-urinary tract.

The sum total of the experiments with human tuberculosis embraced 39 different cultures, 23 from adults and 16 from children. Nineteen of these cultures failed altogether in producing any marked changes in the inoculated animals; nine caused the appearance, in the course of four months, of small infectious foci in the nearest lymphatic glands, but without any further spread of the disease, in seven other cases there was a somewhat more considerable affection of the lymphatics, and only four cases in which the inoculation was made from the virus of children was there noted a general infection. The conclusion drawn was, that notwithstanding Koch's view of the small danger of transferring bovine tuberculosis to man, a few of the cases in which this danger became a reality should serve as a warning against the use of raw milk from infected animals as a food for children.

In the very animated discussions that followed the report, Prof. Orth, Virchow's successor at the Berlin University, called attention to the fact that extreme caution should be exercised in drawing conclusions from observations on the transmission of tuberculosis from animals to man. He referred to the statement of Schütz (Koch's co-worker in the Veterinary Institute) that the pearly distemper of cattle (bovine tuberculosis) may, though very rarely, be transmitted to man. The observation that those working over cadavers of cattle less frequently became affected with what is known as the cadaver tubercles of the hand, than those who perform autopsies on human beings is, according to Orth, due to the fact that cattle in general suffer less from tuberculosis than man. Moreover, it remains yet to be proven that this affection is really of a tuberculous nature. It is quite likely that we have to do here with a form of mixed infection. The differences in the pathological anatomy of tuberculosis in man and that of the pearly distemper in cattle are accounted for by the differences in the anatomical structure, for it is a well-known fact that the same infectious principle presents a different pathological and clinical course in different living beings. It is sufficient to compare tuberculosis in man and in the guinea-pig.

Domesticated animals, such as goats and pigs, are easily susceptible to human tuberculosis, as Schütz himself proved some twenty years ago. Orth inoculated five calves with human tuberculosis, and of these, two fell victims to a severe form of general tuberculosis. The data communicated by the Sanitary Bureau go to show that

ten per cent. of all inoculations of cattle by human tuberculosis resulted in severe forms of the disease; twenty-eight per cent. of the cultures of tubercle bacilli from man turned out to be pathogenetic for cattle. Koch and his followers assert that tuberculosis which is transferred from man to cattle is not human tuberculosis but the "pearl disease." If that be the case, then it is clear that man may become infected from cattle and vice versa, and all the measures adopted hitherto to prevent the spread of the infection from cattle to man must remain in their present force.

The discussion on the subject became so heated that in replying to Prof. Schütz, Dr. Orth was forced to confess his astonishment at the attitude of Koch's followers who have tinctured the question with a peculiarly personal element as if defending the personality of Koch himself. The fame of the great bacteriologist, as Orth well remarked, is so firmly established that it would not suffer a whit even if he acknowledged that he had committed an error; for in scientific questions truth must stand above every other consideration: *Amicus Schütz, amicus Koch, sed magis amica veritas.*

PROLONGATION OF HUMAN LIFE.

ACCORDING to the last census the average length of human life in the United States had increased during the previous ten years from somewhat less than thirty-two years to nearly thirty-six years. There are those who doubt the value of census statistics in matters of this kind and who consider that many variable factors enter into the problem of vital statistics and that so much improvement has occurred in the gathering of these data in recent years that the results may, after all, mean very little in the concrete and only indicate a better state of knowledge rather than a better state of health. To such doubters it will be interesting to learn that the actuaries of the life insurance companies of the world, in their meeting here in New York, last week, were agreed that there has been a very notable lengthening of the average of human life, during the latter part of the nineteenth century. As on the calculations of their actuaries depends the rate for life insurance which the companies must charge, in order that their business may not be a losing venture, it seems very evident that the lengthening of human life is no mere theoretical consideration but is an actual fact on which serious-minded business men are satisfied to risk money.

A number of communications, read before the meeting, showed that the principal reason for the lengthening of human life is to be found in the lessened death-rate from contagious diseases. Epidemics of cholera, which were a matter of constant recurrence every ten years, if not oftener, in the early part of the nineteenth century, in many cities of the old and new world, are now definitely a thing of the past. Yellow fever is another of the diseases whose mortality has been very decidedly decreased during the last half of the nineteenth century.

It must not be forgotten that cities so far north as Philadelphia, New York, and even Boston, were liable to recurring epidemics of yellow fever, that made great havoc especially among the poorer population. This improvement in vital statistics is undoubtedly permanent and makes the problem of life insurance much simpler than it was even fifty years ago.

It is, however, among children especially that the lessening of the death-rate has brought about a definite increase in the length of life. Children are more likely to contract contagious disease than are adults. The statistics show that in the last thirty years the mortality of such diseases as scarlet fever, whooping-cough, diphtheria and the diarrheal diseases of children have been very materially reduced. Curiously enough the mortality from measles remains nearly the same as it was quite half a century ago. This seems to be because pneumonia is a frequent complication of measles. As is well known, the death-rate from pneumonia has surely not been decreased in recent years and has probably even increased in spite of every effort on the part of medical men and the most careful study of the disease, its possible prevention and methods of treatment. It is in the group of infectious throat diseases that the most striking diminution of mortality has occurred. The death-rate from diphtheria is now probably less than one-third the rate of fifty years ago. Those who are opposed to the use of antitoxin may well read a lesson for themselves in this fact.

As the data become more definite and more complete in recent years the reduction in mortality becomes more evident. Each year of the last decade, for instance, has shown a definite amelioration in the death-rate not only as regards the country at large, but especially as regards city life in various parts of the country. If such widely separated cities as New York and San Francisco, Boston and Savannah, Lowell and Baltimore, Brooklyn and Pittsburg, be considered, it is found that not only during the last five

decades has there been a constant decrease in the city's mortality rate, but that this is especially noticeable in the last decade when the more careful collection of statistics might have made the death-rate appear comparatively higher than in the earlier years, when so much diligence in collecting death reports was not employed. It is very interesting to find that at last there is to be a definite recognition on the part of those outside of the medical profession of how much modern medical science has done to make life less full of suffering as well as actually longer.

A great deal remains to be done, however, for with regard to certain diseases there has been no improvement in the mortality notwithstanding all the advances in medicine. In certain diseases the conditions seem to be actually worse than they were half a century ago, and the death-rate from them is higher. While such city scourges as smallpox, typhoid fever, and tuberculosis are much reduced in mortality, pneumonia has certainly not lost any of its fatality and cancer is actually much more extensively fatal than with past generations. As a matter of fact, cancer at the present time accounts for as many deaths in our cities as do all of the infectious diseases taken together, with the exception of those which affect the respiratory tract. Cancer mortality has more than doubled during the last thirty years. Evidently the studious attention of the present generation must be concentrated upon these maladies if we are to continue the work that the last generation accomplished so successfully. The very fact that while the sanitation of cities has decreased the death-rate for infectious diseases it yet has allowed that from cancer to increase may point to the fact that all of the investigations thus far undertaken with regard to cancer have been misdirected. In any case, this is the problem that must be faced. Let us hope that its successful solution is near at hand.

ECHOES AND NEWS.

NEW YORK.

Opening College of Physicians and Surgeons.—The opening exercises of the academic year 1903-4 will be held in the Lower Lecture Room on Thursday, September 24, 1903, at three o'clock p. m. After a brief address of welcome by the President of the University an address will be delivered by Walter B. James, M.D., Professor of the practice of Medicine, upon "The Old and the New Medicine."

Medical School Inspectors Appointed.—Health Commissioner Lederle appointed recently about 50 physicians to make up the corps of medical school inspectors for this borough. About 25 were appointed for work in the other boroughs. The number of medical school inspectors will be smaller than usual this year because of lack of funds to employ them. They will begin work on September 21.

New Gouverneur Hospital to Be Completed.—Plans have been filed with the Building Bureau for the completion of the new Gouverneur Hospital at Gouverneur Slip, running through the block from Front to Water street. The plans provide for the west wing to the present five-story and basement main building, also for a one-story extension into the rear courtyard and for a two-story ambulance station, with a stable, fronting on Front street. The completed building will be of brick, stone and terra cotta, 116 feet front, and have two wings, each 140 feet deep and when finished and equipped will have cost about half a million dollars. The west wing and extension are to cost $250,000 and the ambulance station an additional $25,000.

Sterile Milk and Infant Mortality.—The summer pasteurized milk depots maintained by Nathan Straus closed on Saturday, having dispensed more pasteurized (sterilized) milk than in any previous year since the beginning of the work in 1892. Much of the success of the season's work was due to the earnest cooperation of the Health Department. At the beginning of the summer season Dr. Lederle caused cards of instruction as to the proper feeding of infants to be displayed in every tenement in the city. These cards gave the location of all the Straus milk depots, and were in the nature of an educational propaganda making for good health among the tenement dwellers. All the members of the free corps of physicians of the Health Department carried gratuitous coupons for pasteurized milk, which they distributed where needed. These depots will remain open throughout the year: At 151 Avenue C; 45 Monroe street; 241 East Fifty-ninth street, and 235 West Sixtieth street. At these depots all gratuitous coupons will be honored. The depots in the playgrounds of the public schools were a new feature of the charity this year. They were so placed at the request of the Board of Education. The comparatively low death rate prevailing in New York among infants in recent years has caused other large cities to look for the cause, with the result that the present season has also seen the establishment of pasteurized milk dispensaries in Chicago and Philadelphia, modeled after the plans of Mr. Straus in New York. In both these cities Mr. Straus gave the plant for pasteurizing. With the increase from year to year of the amount of pasteurized milk dispensed, a marked and consistent decrease in the death rate of children under five years of age has been noticeable. In 1891 the death rate for children under five years old during June, July and August was 126 per thousand. In 1897 it dropped to 91.3 per thousand. This year it was only 63.6.

"The Malaria Map."—Of course, according to the recent explanation of the causation of malaria, this must be in some degree regarded as a misnomer, but that it still exerts a potent influence is very apparent to the real estate agent. The correct and official name of the map is, "A Topographical Map of the City of New York," and it was prepared by the late Gen. Egbert L. Viele for the Council of Hygiene and Public Health of the Citizens' Association in 1865. It has been adopted by the Health Department of New York, and copies of it are to be found framed and hanging on the wall of many physicians' offices. The map shows the Island of Manhattan as it was before the Dutch settlers bought it from the Indians and as it was in 1865. That is to say, underneath the labyrinth of streets are represented the hills and

valleys, the swamps and meadows, the streams and water courses as they were before the leveling hand of the street-maker and house-builder made the whole island a monotonous wilderness of brick, mortar, block pavement, and asphalt. Some of the tales told by this map are revelations to those who know only the New York of to-day. Of course every old New Yorker knows that the Tombs stands on the site of the old Collect Pond, and that Canal street was once the bed of a canal, but how many know that West One Hundred and Sixth street was once the bed of a river, and that the hill between Columbus and Amsterdam avenues is caused by the masonry of the abandoned aqueduct? How many remember now that the territory from Eighty-fifth to Ninety-fourth street, between Central Park West and the Hudson, was once rolling meadow land, and that from Ninety-fourth to One Hundred and Second street was a region of swamps, cut up by numerous small streams? Who can tell now that from One Hundred and Fifth to One Hundred and Eleventh street on the west side was a region of rocks and hills, with brooks and rivulets everywhere, so that, while one house may be on a rock foundation, the next one to it may have a cellar constantly wet from the forgotten brook which flows under it? All the streams of this section were tributary to a good-sized river which flowed into the East river in the neighborhood of Ninety-sixth street. All this is told by the "malaria map." Perhaps this will explain to some landlords why apartments which are cheap and apparently in every way desirable are rejected after a list of streets has been consulted by the prospective tenant.

Experimental Work at Cornell.—The Cornell University Medical College in New York City has provided for a Chair of Experimental Pathology and Bacteriology, to carry on research work, independently of the regular instruction given to undergraduates. Dr. B. H. Buxton is to be in charge and will be assisted by Dr. Victor C. Vaughan, Jr. The pathological organic chemistry, so intimately associated with all the problems of disordered metabolism, will be under the direction of Mr. Beebe. This work is to be entirely distinct from all undergraduate or postgraduate instruction and purely for the advancement of scientific knowledge, and is to be conducted in the Loomis Laboratory, a building originally designed especially for this purpose.

PHILADELPHIA.

Officers of Cumberland Medical Society.—At the organization of the Cumberland Valley Medical Society, held at Mount Alto Park, September 8, the following officers were elected: President, Dr. R. W. Ramsey, Chambersburg; Vice-Presidents, Dr. James Elvy Hilsee, Carlisle; Dr. T. H. Weagley, Marion; Dr. J. W. Humrichouse, Hagerstown, Md.; Secretary, Dr. J. J. Coffman, Scotland; Assistant Secretaries, Dr. R. A. Mille, Carlisle; Dr. P. B. Montgomery, Chambersburg; Treasurer, Dr. J. H. Montgomery, Chambersburg.

Charter Obtained by Phipps Institute.—A charter has been granted to the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis. The managers of that institution are now in position to purchase property and erect permanent buildings to carry forward the work recently begun in a small way at a temporary location on Pine street. The directors chosen to act for the first year are Henry Phipps, George E. Gordon, of New York, and Dr. Lawrence F. Flick. Amy F. Phipps and Samuel B. Harbison, of Pittsburg, in conjunction with the three directors, are named as subscribers. The site for the permanent location of the institute has not yet been finally selected.

No Vaccination in Schools.—The visits to schools by the district vaccine physicians have been discontinued while arrangements for inspection of the children's vaccination marks are being made by the Committee on Hygiene of the Board of Education. It is thought that arrangements can be made whereby all children not vaccinated within five years or having deficient marks may be revaccinated by the family physicians of their parents. The inspection will be made by physicians who are members of the school faculties or by volunteer physicians appointed by the Board. It is understood that the school controllers will in every instance prohibit the vaccination of pupils in school buildings.

Marriage of Dr. Flexner.—The marriage of Dr. Simon Flexner and Miss Helen Thomas, of Bryn Mawr, took place on Thursday, September 17. Miss Thomas is a sister of Miss M. Carey Thomas, President of Bryn Mawr College.

CHICAGO.

American Association of Obstetricians and Gynecologists.—The sixteenth annual meeting of this Association will be held in this city September 22, 23, and 24. Arrangements are being made by the local committee for the entertainment of the Fellows and their guests. The sessions will be held in the law library of the Northwestern University Building, corner Dearborn and Lake streets.

Incorporation of Pasteur Institute.—The Chicago Pasteur Institute has been incorporated by A. P. Lagorio, Carlotta Lagorio, and B. G. Bruno, with a capital stock of $2,000 to treat hydrophobia.

Willard Hospital Buys Land.—The Francis E. Willard National Temperance Hospital has purchased property at 349 Lincoln street, for $1,500. It is 24x115 feet and is 338 feet north of West Polk street.

Diphtheria.—The prevalence of this disease during the week has resulted in seven children being excluded from the W. K. Sullivan School. At least five of them are believed to be suffering from the disease, while the other two are known to have been exposed. All the children excluded from school have lived in dwellings where the disease prevailed. The children were prevented from entering the school through the activity of Superintendent Bodine of the Compulsory Education Department and Dr. Allen with several assistants. The work of the inspectors will continue until all signs of the disease disappear from that vicinity.

Tour of Inspection by Sanitary Experts.—Sanitary experts representing the State of Illinois and the Sanitary District will leave Chicago Sept. 16, on a tour of inspection of the Illinois water way via the drainage canal and the Illinois River from Chicago to St. Louis. Their purpose is to prepare the evidence for Illinois to be submitted at the hearing of the sanitary case between the States of Illinois and Missouri, which is to open in this city Sept. 21. Missouri claims that the drainage canal is a menace to the health of the people of Missouri in general and St. Louis in particular, by contaminating the water supply. In the party will be Prof. Long, of Northwest University; Profs. Palmer and Burroughs, of the University of Illinois; Prof. Jordan, of the University of Chicago; Dr. Adolph Gehrmann; W. P. Mason, a noted sanitary engineer of New York; H. L. Russell, of the University of Wisconsin; E. G. Smith, of Beloit College; L. C. Kinnecott, of the

Worcester Polytechnic; Rudolph Hering, head of the Hering Commission, which made the pioneer investigation of Chicago sewage, on which the canal project was founded, and Dr. Reynolds, Commissioner of Health of Chicago. The experts will devote five days to the trip. They will observe conditions of overflow, the backwaters of the various dams along the river, the color of the water at different points, and comparative sanitary conditions below and above Peoria. They will note the improvement of the river from Chicago to Peoria and the effect on the river caused by Peoria sewage, arising from cattlesheds, distilleries, glucose refineries, stockyards, slaughter houses and gas houses and manufacturing establishments.

Disposal of City Refuse.—The disposal of garbage has become a very important question in this city. Complaints have been made that in some wards the appropriations for the work of collection of garbage were so small that the work might have to be abandoned. In reference to the system of carting the refuse to open dumps, this has always been reprehensible, and, owing to the growth of the city, should not now be tolerated. It means the maintenance of a most obnoxious nuisance. It is interesting to note that many cities have and are in favor of garbage cremation or reduction plants. We give here the names of some of the cities with the method of treatment employed: Boston, reduction; Buffalo, reduction; New York, reduction; Philadelphia, reduction; Washington, reduction; Louisville, cremation; Cincinnati, reduction; Cleveland, reduction; Detroit, reduction; Milwaukee, cremation; Minneapolis, cremation; St. Louis, reduction; San Francisco, cremation. The list is a rebuke to Chicago, but greater instruction will be found in a municipal year book, which is published in England. This gives us a glimpse of municipalities at work, which shows that we are merely in the kindergarten stage in this country. Speaking of the cleansing department of Manchester, the book says: "For the year ended March, 1902, it dealt with 370,877 tons of refuse, consisting of night soil, street sweepings, market, slaughter-house trading refuse and contents of pail closets. The department is a great manufacturing concern; it makes manure, oil, soap, tallow, mortar; it has two large estates of 3,681 acres, upon which part of the refuse of the city is disposed of, and has workshops where it makes implements, vans, railway trucks, brushes, machines, etc. Nearly 2,000 men are employed by the department, which has over 400 horses and 500 vans and carts. Refuse which cannot be utilized is burned in destructors." When such an elaborate system as this is compared with the crude makeshift to which Chicago resorts, the difference seems almost as great as the difference between a savage and a civilized state of society. The aldermen who are now investigating the subject should realize how far Chicago is behind, and strive at least to make a good beginning.

Mortality Rate.—The average August death-rate of the ten years (1893-1902 inclusive) was 16.37 per thousand of population per annum. For August, 1903, the 2,255 deaths reported gave an annual rate of 14.07 per thousand, or 16 per cent. less than the ten-year average, and the lowest August mortality rate on record. The chief reduction is in the deaths under five years and in those from the acute intestinal diseases, from typhoid fever and from whooping cough to which the low temperature and the good sanitary quality of the water contributed. There were 185 fewer deaths from the impure water diseases than in August, 1902. On the other hand, the deaths from diseases especially affecting adult male life all show an increase over last year. The excess of male over female deaths is 27.7 per cent.

Duty of Injured Persons in Employment of Physicians.—The Appellate Court of Illinois for the Fourth District holds in C. and E. I. R.R. Co. vs. Burridge, a personal injury case, brought by the latter party, that an instruction stated the law correctly which told the jury that it was the duty of the party suing "to employ such doctor or doctors for the treatment of his injuries as ordinary prudence in his situation at the time of the injury and thereafter required; and to use ordinary judgment and care in so doing, and to select only such doctor as was of at least ordinary skill and care in his profession; but the law does not make him an insurer in such case that the doctor will be guilty of no negligence, error in judgment, or want of care, and where such errors or mistakes occur in the treatment, the injury resulting from such mistakes is properly regarded as part of the immediate and direct damages resulting from the injury."

Milk for Schools.—The children in the Chicago public schools will no longer have to drink impure water, if a proposal of the Milk Commission meets with the approval of the Board of Education. Pasteurized milk, on sale at a cent a bottle at every school, is the solution of the problem suggested by the commission. At the Thomas Hoyne school, where the pasteurizing plant is located, the water has been shut off from the building while some repairs have been in progress. More than 300 three-ounce bottles were taken in the course of the day.

GENERAL.

Trichinosis in Germany.—Last week we noted the occurrence of two hundred cases of trichinosis at Homburg. Forty cases are now reported at Neustadt, near Coburg. Some of them have proven of a severe and dangerous type.

Appointment of Dr. Hutchings.—The State Commission in Lunacy has appointed Dr. Richard H. Hutchings medical superintendent of the St. Lawrence State Hospital at Ogdensburg, N. Y., in succession to Dr. William Mabon, who recently accepted the post of general superintendent of the New York City hospitals.

Yellow Fever.—The State Health Officer of Texas, received telegraphic reports from Dr. I. P. Sessions, whom he sent to Mexico to investigate the yellow fever situation, stating that the disease had appeared at Monterey. According to official statements from the Yucatan Government there were 128 cases of yellow fever in the city of Merida during August of which fifty proved fatal. In Progreso during the same time there were nine cases, but no deaths.

The Plague at Marseilles.—A number of buildings on the outskirts of this city, where suspected cases of bubonic plague had been reported, were destroyed by fire to-day. The sanitary officials used sulphur in the disinfection of merchandise in the buildings, and the flames were communicated to the buildings themselves. Only the walls were left standing. The unofficial reports make the situation serious. The dead, it appears, are four women and two men, whose bodies were covered with buboes, leaving little doubt as to the nature of the disease. Eighteen suspects, including four infants, are under surveillance. Three undoubted cases have been admitted to the hospital. The vessel which brought the cargo of rags has been isolated. Other rigid sanitary

measures have been adopted, and it is believed that the authorities desired the removal of the burned buildings as an additional precaution. The local authorities at Genoa have quarantined against Marseilles.

Enlarge Naval Hospital.—Surgeon Gen. Rixey has decided to urge on Congress the enlargement of the General Naval Hospital at Portsmouth, Va. The institution now has 200 beds, and he will recommend that it be enlarged so as to accommodate 500. Two modern wings will be erected in rear of the present structure, and a third wing will connect these. There will be isolation wards and every modern convenience. A new steam generating plant and a pest house will form part of the scheme of improvement. Dr. Rixey states that as Portsmouth is to be one of the largest naval stations in America, the facilities for the care of the sick and wounded must of necessity keep pace with the growth of the naval establishment in size and importance.

Income of the French Physician.—There are a few physicians in Paris with incomes of $40,000 to $60,000. The average income of French physicians, however, is only $550 a year, or $720 in Paris. Yet, whereas the number of medical men is rapidly decreasing in Germany and Austria, it is still increasing in France. In 1901 there were 2,000 fewer than there are now, though the population was about the same.

Convenient Device.—A novel dose-indicator for medicine bottles which has been recently put on the market consists of a disc of cardboard on which is printed the hours of the day in much the same manner as the dial of a timepiece, with the hours divided into quarters. In the upper part of this device there is a loop designed to be fastened around the neck of the bottle and which holds the dial suspended prominently on the side of the bottle. As one dose of medicine is disposed of the exact time of the next one is indicated by moving a clip along to the proper point.

Cholera in Syria.—Cholera is reported to be raging fiercely at Birejik, Syria. Birejik is a town of ten thousand inhabitants on the left bank of the Euphrates, at the head of navigation.

The Prize Essay of the American Medical Association.—The American Medical Association offers annually a gold medal, value of $100 for the best essay on any subject relating to medicine or surgery. The recipient of this prize will be given the option of the gold medal, or a bronze replica of the medal, and the balance of the appropriation (about $90) in money; or the entire amount ($100) in money. Inasmuch as the Association annually sets apart the sum of $500 for original research, this prize is offered to stimulate the production of a superior practical paper based either upon experimental studies or clinical investigation, or both. The Committee will give preference to papers having the greatest brevity consistent with thorough consideration of the subject, and recommends that the paper shall not exceed 5,000 words. The Committee, while not restricting the choice of subjects, recommends as an important subject for consideration "The Therapeutic Value of the Digestive Ferments." Competing essays must be type-written, and bear no mark revealing their authorship; but instead of the name of the author there must appear on each essay a motto, and accompanying each essay a sealed envelope containing the name of the author and bearing on its outer surface the motto of identification. No envelope will be opened by the Committee until a decision has been reached as to the most deserving essay. The other essays will be returned to their respective authors. The Committee reserves the right to reject all essays, if none are found worthy of the Association medal. Competing essays must be in the hands of the Chairman of the Committee not later than April 1, 1904. Lewis S. McMurtry, Louisville, Ky., Chairman; Burnside Foster, St. Paul, Minn.; M. H. Fussell, Philadelphia, Pa., Committee.

Cancer Caused Pope's Death.—Drs. Lapponi and Mazzoni, the physicians of the late Pope Leo, have published a defence against the attacks made upon them by Dr. Cardarelli, who practically charged that they had made a wrong diagnosis of the Pope's disease, and declared that he died of pulmonary cancer instead of pleurisy or pleuro-pneumonia. Both physicians say that they detected the true nature of the Pope's illness, but Cardinal Rampolla, the Papal Secretary of State, objected to having it made public. When the symptoms became clearer they insisted upon being allowed to protect their reputations against easily foreseen criticism, but Cardinal Rampolla was immovable. He even refused to have it announced that a third operation of thoracentesis had been performed, although Drs. Lapponi and Mazzoni did perform such an operation. The physicians, therefore, wrote in the presence of a witness a full history of the case, giving the real nature of the disease. Copies of the statement were given to Cardinal Rampolla and the major domo of the Vatican.

Fighting to Keep Out Smallpox.—The State Health Department is urging extraordinary precautions against a smallpox epidemic in the town of Hoosick and the village of Hoosick Falls. There are more than a dozen cases at Bennington, Vt., which is connected by trolley line with the Hoosick neighborhood. No cases have yet crossed the State line, and it is hoped that general vaccination will prevent spreading the disease.

CORRESPONDENCE.

AN IMPOSTER.

To the Editor of MEDICAL NEWS:

DEAR SIR: Permit me through the medium of your valuable journal to warn the profession concerning a young man who pretends to be my nephew, and on various pretexts secures money, mostly, I regret to say, from my personal friends. I have no nephew by the name of Musser, and know of no one who dare use my name in any scheme whatsoever.

I should add, Mr. P. Corzelius, representing the American Medical Association, has a letter from me, as well as other means of identity, for the purpose of carrying on his work.

Yours very truly,

J. H. MUSSER.

1927 Chestnut St., Philadelphia, Sept. 11, 1903.

THE HISTORY OF THE DISTRIBUTION OF STERILIZED MILK TO TENEMENT HOUSE CHILDREN IN NEW YORK.

To the Editor of the MEDICAL NEWS:

DEAR SIR: In an article on the subject of infant mortality, by Dr. Rowland G. Freeman, in the MEDICAL NEWS of September 5, 1903, the following statement occurs, speaking of the distribution of milk, or as the

author says, a "suitable nutriment to the bottle-fed babies of the tenements;" by this we must all understand pasteurized or sterilized milk.

"New York City owes to Nathan Straus a great debt of gratitude for *inaugurating* or *carrying out*, at his own expense, this most valuable aid to its tenement house babies."

The facts in connection with the inauguration and distribution of good and fit milk to the children of the poor, are as follows:

The main idea of distributing milk, suitable for infant feeding, among the poor of the tenement districts of New York, originated with the author of this communication. After having been in charge of the children's class of the Good Samaritan Dispensary, then the Eastern, for some time, and noticing from year to year the futile attempts to treat the gastro-intestinal disturbances of infancy and childhood during the summer months, without the aid of a suitable nutriment, I began to agitate the placing within the reach of the sick poor children of a nutriment which was not only suitable (modified), but which could not easily be rendered unfit for the infant, as regards acidity and bacterial content. I began the distribution of bottles of sterilized milk to sick infants in May, 1890. At this time the scheme was rather discouraged, because as one physician, a chairman of one of our societies, said, the washing of the bottles would be the chief obstacle. Undaunted, however, I constructed apparatus, and after much labor, opened my laboratory, such as it was, in the summer of 1890. I presented the apparatus before the County Medical Society in May, 1890, and before the Pediatric Section of the Academy, in November of the same year, I read a paper embodying my experiences. That summer I had only supplied 134 infants with 7,000 bottles of sterilized modified milk, but it was a beginning. Mrs. Felix Adler, through her physician, Dr. Richard Stein, heard of my efforts to reach the poor children, and seeing I was handicapped by lack of funds, she organized a committee of ladies, the first of its kind, to establish a large plant which would furnish sterilized milk to tenement house babies. This improved laboratory was opened in 1891, and from June 15 to October 15, 1891, 575 children were fed with 40,000 bottles of sterilized milk. I then began to try to reduce the temperature of sterilization, and found 85° C., or 185° F., consistent with safety, instead of 100° C., or 212° F. My results were again published in the *New York Medical Journal*, October 15, 1891. In the year 1892 to 1893, we supplied 1268 children with 97,000 bottles of this milk, sterilized at this low temperature. Two years before this we had established two sub-stations for sterilized milk, one at Jungmann's pharmacy, Sixtieth street, and another in Harlem. Our funds gave out in the subsequent year, and we devoted our energies to our own dispensary plant, where the demand was most pressing. About this time, 1893, Mr. Straus sent his representative, Mr. Kinkead, to my laboratory, saw our work, and I also gave him a note to Dr. T. M. Rotch, of Boston, who had at that time established the Walker-Gordon Laboratory. Mr. Straus received and adopted many suggestions as to the washing and sterilizing of bottles, also corking, which he adopted in his first plant, and which he was then about to open. His representative saw me several times, and also listened to my papers read before the Academy. To be concise:

In 1894 we distributed about 150,000 bottles, whereas all the Straus depots distributed 300,000.

In the year 1899, the ninth to tenth year of our existence, I was feeding a daily average of 200 children and giving away 379,776 bottles of milk a year, sometimes pasteurized, others sterilized, according to the weather. This is more than half the number distributed by Mr. Straus' many depots in the same year. To-day the laboratory I first established is feeding on an average of 200 babies of the tenements daily with milk, either sterilized or pasteurized, according to the exigencies of the weather, and the directions of the physicians. I may say that, from the very start, my idea was only to give the milk on a prescription from a physician, which has always been done. This is the only orderly way of distributing milk for infant feeding.

I have in the above given a succinct history of the inception, the inauguration and the success of the main idea of giving the poor sick children of New York the milk, their life food, in a form in accordance with scientific advances of infant feeding. In doing this I am actuated by the same motives I was in the inception of the affair. The credit of this method of feeding the poor belongs to the writer of this communication, who, at the sacrifice of labor which cannot be estimated, and his own means, carried it to completion. Let no one think that I do not appreciate the wise and philanthropic efforts of one of our most respected lay citizens; far from it, and glory to him; but to the medical profession and to us here in New York, belongs the credit of the whole idea and its successful operation to-day. More especially should the profession take unto itself the credit of this idea, inasmuch as, in the year in which the decline of mortality is shown by Dr. Freeman, to be decided, the Good Samaritan Dispensary laboratory, under my guidance, was contributing to the infants of a most densely crowded tenement district, more than half as many bottles of sterilized milk as the whole aggregate of the Straus depots (600,000).

692 Madison Ave., HENRY KOPLIK, M.D.
New York, Sept. 8, 1903.

TRANSACTIONS OF FOREIGN SOCIETIES.

German.

Tendoplasty.—The German Society for Orthopedic Surgery, Second Congress, held in Berlin, June 2, 1903, was opened by VULPIUS, who presented a paper on tendoplasty, based upon his own extensive experience with 400 cases. Most methods employed for elongating tendons are followed by good results. The newly formed tissue is fibrous and later becomes tendinous if hemorrhage and infection do not occur. Tendons are best shortened by means of partial excision or suture. An atrophic muscle may thus regain its function by overdistention and loose joints can be rendered firm. Tendon transplantation is a more difficult operation; the speaker's own method or the periosteal or transosteal modifications all give good results. Silk tendons to fill in gaps are recommended only where no other method is possible. Peripheral paralyses are most amenable to treatment, but in poliomyelitis, Little's disease and apoplectic hemiplegia much improvement is often seen. Arthogenous contracture of the knee-joint, congenital clubfoot and flatfoot will often yield to transplantation. Defects in tendons may be treated by using a neighboring tendon or by implanting human or animal tendons or pieces of silk or catgut.

F. LANGE prefers total transplantation in the leg, since the function will be more perfect than where only part of an adjoining tendon is used. He uses his method where more than three muscles are paralytic and discusses new points of insertion to restore the most perfect functions. Where periosteal transplantation is indicated, the sutures are also passed through the ligaments and cartilage, to give the tendon a better hold. Silk is to be preferred here, and abscesses are avoided

by draining for forty-eight hours. Three silk tendons were demonstrated, which had functionated for two and three years and which were surrounded and permeated by tendinous tissue.

In the discussion which followed SCHANZ recommended aluminium-bronze as suture material. WITTEK has attempted to transplant the ileopsoas so that it will act as extensor. VULPIUS also praises total transplantation, but states that this method cannot always be resorted to.

Treatment of Fractures.—A paper on the treatment of fractures implicating joints by means of extension and orthopedic procedures was read by BARDENHEUER.

Spondylitic Curvature of the Spine.—FINK treats spondylitic curvature of the spine by horizontal position in plaster of Paris, aided by strips of cotton applied crosswise under the deformity. After about a year the patients begin to wear a corset.

Coxa Vara.—The etiology and forms of congenital and acquired coxa vara were discussed by JOACHIMSTHAL. BORCHARDT looks upon a traumatic separation of the epiphysis as real cause, while FRÖHLICH detected the *Staphylococcus albus* in the bone-marrow of two cases, and ascribes the deformity to early, chronic osteomyelitis. Good results are obtained according to CODIVILLA from osteotomy in the neighborhood of the trochanter with fixation of the shaft in abduction.

The final papers were read by BADE, who improved the corset for scoliosis by a rubber bag on its inner side, which can be inflated, and by SPITZY, whose clinical and anatomical investigations show that the newly born never possess flat feet.

SOCIETY PROCEEDINGS.

BRITISH MEDICAL ASSOCIATION.

Seventy-first Annual Meeting, Held in Swansea, July 28, 29, 30 and 31, 1903.

(Continued from Page 528.)

The Methods at Present in Vogue for the Reduction of the Dislocation.—"I shall confine myself to the measures at present employed, and I shall also deal only with those that aim at the reduction of the dislocation, without wasting time on the question of apparatus and orthopedic appliances. It may fairly be said at the present time that all cases of a suitable age should be submitted to some form of operative treatment, and that those who are over that age will probably get on better without apparatus than with it; there seems to be no really satisfactory apparatus in use, nor, indeed, does it seem likely that such a thing could be designed. In discussing the question of the methods employed for the reduction of the dislocation, the foremost place, at any rate on the ground of priority, belongs to the operative procedure commonly known as the 'Hoffa-Lorenz' method, which is still practised by so well-known an authority as Professor Hoffa, or at all events was advocated by him so recently as the Thirteenth International Medical Congress held at Paris in 1900.

The Hoffa-Lorenz Operation.—"The steps of the operation are briefly as follows: The patient is anesthetized, and full extension is made until the trochanter is nearly on a level with Nélaton's line. While full extension is maintained, an incision is made parallel with the anterior margin of the great trochanter, and one-quarter of an inch in front of it and commencing at its upper angle.

"The fascia lata is fully opened up, the gluteus medius and minimus are retracted, and the capsule of the hip-joint is opened by an incision made upon the neck of the bone while the assistant, who still keeps up extension, abducts and rotates out the limb in order to facilitate this. The capsule is slit up right to its insertion into the rim of the acetabulum, and, if this does not allow the head of the bone to come well up into the wound, the incision in the capsule is made T-shaped by a second incision parallel to the anterior intertrochanteric line! The finger is then introduced into the acetabulum, which is deepened with a gouge or a sharp spoon. Hoffa lays stress on the new acetabulum being made circular, with deep and overhanging edges, especially above. This new acetabulum is fashioned, partly by deepening the old one and partly by gouging away bone from its upper and outer rim. The head is now replaced in the acetabulum, chiefly by traction, and if necessary is trimmed until it fits it. The wound is left open, and is packed with gauze. Outside this a plaster-of-Paris spica is applied, while the assistant maintains the extension and also keeps the limb in a position of abduction and slight inward rotation. The child is finally placed in a Phelp's box. The limb is kept in plaster for three of four weeks, at the end of which the child has electrical treatment and gymnastic exercises daily, with special attention to the abduction movements.

"There are several objections to this method, any of which are sufficient to put it out of court as a routine treatment for congenital dislocation. Indeed, Hoffa himself realizes this, and only advocates the operation for cases in which Lorenz's 'bloodless method' has failed, or for children beyond the age at which the latter method is likely to be successful. The great objection is the risk of anchylosis which is likely to follow the extensive interference with the joint surfaces; this risk is still further ncreased by Hoffa's plan of leaving the wound open and stuffing it with gauze. This latter procedure, which Hoffa advocates in order to minimize the risk of sepsis, I believe to be quite unnecessary, but even without it the risk of anchylosis is necessarily great. Whenever both articular surfaces are denuded of their cartilaginous covering, especially in a young child, anchylosis, generally of a severe type, is almost certain to follow even in spite of vigorous passive movement.

Burghard's Method.—"In order to overcome the difficulties presented by this operation, and at the same time to ensure the true reduction of the dislocation, I have been in the habit for some years past of practising an operation that combines to some extent the more important features of the 'bloodless method' with the certainty of the open operation. The real merit of Lorenz's so-called 'bloodless method' is not that it is bloodless—for that is its weak point—but that it calls attention to two facts that must receive adequate treatment if success is to be obtained. The first fact is that the chief obstacle to reduction, as far as the muscles are concerned, lies in the shortening of the adductors, and the second is that after reduction the only stable position for the limb in the majority of cases is one of extreme abduction. These two important points I utilize in the following operation.

"At a preliminary sitting, under full anesthesia, the adductors are either fully stretched or are divided with a tenotome; the procedure in fact is so far similar to the 'bloodless method' which will be described immediately. If reduction is effected by these means well and good; the limb is then put up as in Lorenz's method, and the results are checked by skiagraphy. Should reduction by these means fail, or should reluxation occur, the hip-joint is exposed at a second sitting, a week later, by an incision from just below the anterior superior iliac spine in the interval between the sartorius and the tensor fasciæ femoris, and the capsule is exposed as for excision and slit up fully, the head of the bone pro-

truded, and the finger introduced into the acetabulum; the ligamentum teres, if present, is cut away. The head of the bone is now guided into the acetabulum by the finger already introduced into it by manipulations closely resembling those in the 'bloodless method,' and when this is accomplished it will generally be found that the limb spontaneously assumes a position of marked abduction and of outward rotation, although the latter position is not at all constant; indeed, where the angle of femoral torsion is very great there will be rotation inward. As a rule I divide the tendon of the iliopsoas obliquely with a pair of blunt-pointed scissors introduced into the wound, as I have found it a powerful agent in inducing reluxation.

"The exact method of incising the capsule is not of much importance: latterly I have made it parallel to the long axis of the neck of the femur and over the head of the bone made prominent by rotating the limb outwards. This has the advantage that the incision is in the lax portion of the capsule and allows the thickened anterior portion lying over the acetabulum to be more easily defined. It is this latter portion of the capsule that offers the greatest obstacle to reduction; the finger passed through the narrow slit-like opening between it and the upper edge of the acetabulum will ascertain whether there is room for the head to pass into position, and if not, a way must be made for it by detaching the capsule from the acetabular rim sufficiently to allow of its passage. It is always well, however, not to detach the capsule too freely from the rim of the acetabulum as the various bands in that situation are powerful agents in preventing the head of the bone from slipping out of place. No attempt whatever is made to deepen the acetabulum or to shape the head of the bone afresh. There has been no difficulty in getting the head of the bone into the acetabulum in any of the cases operated upon by this method; its exact position is determined by the finger in the wound, and there can be no mistake. In order to maintain the head of the bone in position—which is really the hard part of the procedure—a portion of the lax capsule above the acetabulum is excised by an elliptical incision and the cut edges are brought together with stout catgut sutures. The capacity of the capsule is thus diminished and the joint is rendered more stable. The deeper tissues are finally approximated with catgut sutures and the skin wound is closed without drainage. The operation can be done through an incision about 3 inches in length, and there is practically no bleeding; if more room be required it is easy to curve the incision outward above and to detach part of the origin of the tensor fasciæ femoris from the iliac bone.

"All that now remains to be done is to put up the limb in a suitable immobilization apparatus. At first I employed a modification of Croft's plaster-of-Paris splint, so designed that the wound could be inspected at any time without disturbing the parts, but more recently I have simply put up the limb in a plaster spica, taking in the knee. The Croft's splint was used to avoid the risk of suppuration beneath a fixed plaster bandage; but, as such a thing has never occurred in any of my cases, the ordinary plaster spica is now applied from the first, and allowed to remain undisturbed for three weeks, when it is removed with a Gigli's saw under anesthesia, the stitches taken out, and a fresh spica applied. An X-ray photograph is taken at the same time, and, should the head of the bone be found to have slipped out of place, the wound is opened up and reduction again effected. The position in which the limb is put up in the first instance depends entirely upon the position of maximum stability. In all cases there is one position in which the limb remains without reluxation occurring, and this is the position chosen. It is nearly always the fully abducted position, generally with some outward rotation but often with inward rotation. I have had cases in which the only stable position was that of full extension and rotation inward. The after-treatment corresponds almost exactly to that for the 'bloodless method' except that it takes rather a shorter time. The results will be discussed in connection with those of the latter method.

Lorenz's "Bloodless Method."—"The patient is fully anesthetized and the adductor muscles are first fully stretched or torn through subcutaneously by striking them repeatedly with the ulnar border of the hand while the limb is forcibly abducted. At first the abduction obtained is limited, but as the rupture of the muscles goes on it increases until the limb is abducted through 90 degrees. During this the assistant steadies the pelvis, pressing down the sound side of the pelvis. Should there be much shortening, horizontal traction upon the limb may be made to bring the trochanter down to the level of Nélaton's line, but this is rarely necessary.

"When the parts have thus been fully stretched, reduction of the dislocation is effected by vertical extension, that is, traction upon the limb flexed at right angles to the pelvis. At the same time direct pressure is made over the great trochanter, and, as the extension is reaching its full limit, the limb is carried outwards, that is, abducted through a right angle. By these maneuvers the head of the bone is made to pass forward over the posterior lip of the acetabulum—an event marked by a loud and characteristic click—until it lies over the acetabular depression. In order to fix the head here the limb is put up in a position of abduction, carried if necessary as far as 90 degrees, and at the same time hyperextended and rotated slightly inward. In this position it is kept for four or five months by a plaster spica that does not take in the knee; at the end of this time a second spica is applied after the limb has been brought into a position of moderate abduction combined with a slight degree of flexion and this is kept on for another four or five months, during which time the child is encouraged to walk as much as possible, so that the pressure of the head of the bone against the acetabulum may deepen and develop the latter.

Discussion of the Value of the Foregoing Methods.—"This difficult subject has been aided somewhat by the X-rays. It is now easy to be exact in speaking of the results of treatment, and it is no longer possible to speak of a case as 'cured' when a radiograph shows that the head of the bone is out of place. To this latter category must undoubtedly be relegated a large number of the 'cures' of past years. In future no case can be considered 'cured' unless a radiograph shows the head of the bone in a normal acetabulum, which itself has undergone development and is practically indistinguishable in shape and size and position from its fellow. I could show several cases in which the gait is practically perfect and which most observers would pass as true cures, but in which a radiograph shows the head of the bone above and behind the acetabulum. In speaking of cures among my own cases I mean true cures in the anatomical sense of the term.

"For convenience, the results obtained by any of the foregoing methods of reduction may be divided into three groups; the first is the true anatomical cure in which the affected joint is indistinguishable from the sound one; the second is the group of 'improvements' in which the joint, though not anatomically correct, is nevertheless stable; the gait is markedly improved, and the lordosis is absent, although shortening persists.

Here the head of the bone usually makes for itself a new acetabulum, partly out of the old one and partly out of the ilium above and behind it. Finally, there is the group of failures in which the head of the bone resumes its position on the dorsum ilii, where it slips about as before. By some writers these three groups have been classified as (1) reposition; (2) transposition; and (3) recurrence.

"Great divergence of opinion exists among writers as to the proportion of cases to be allotted to the first two of these groups. There should be no possibility of doubt as to the question of a true radical cure now that radiography is so universally applicable. A glance at a radiographic print will show the difference between a true and a partial cure. When the cure is a true anatomical one the head of the bone lies in the center of the acetabulum; however small or ill-developed the cavity may be, the clear space denoting the Y-cartilage in the acetabulum can always be seen, and the center of the globular head should be directly opposite that. The Y-cartilage is the most reliable landmark in determining whether the head of the bone is in its normal position; the others may be fallacious, owing to the position in which the limb is put up. Should the center of the head lie above the Y-cartilage it is certain that the head, although possibly lying to some extent in the acetabulum, nevertheless does not do so entirely, and that the new joint surface is formed partly at the expense of the old one and partly from the outer surface of the ilium.

It will be obvious from what has gone before that there are fewer difficulties in the way of a true reduction of the dislocation if the attempt be made after opening the joint than if it be made by the 'bloodless method,' and that therefore in order to prove their case the advocates of the latter must be able to point either to better results or to diminished risk. The first and most serious difficulty peculiar to the bloodless method is the covering-in of the acetabulum by the anterior part of the capsule or 'the capsular hymen' that has already been referred to more than once. If the slit-like opening into the acetabulum be too small for the head of the femur to pass through—as in my experience it often is—it is absolutely impossible to obtain true reduction by any mere manipulations: nothing short of an open operation will do. And the chances of the surgeon being confronted with this difficulty must increase with the age of the child, for, as we have seen, the obliteration of the acetabular cavity by the thickened anterior part of the capsule tends to increase as the patient's age advances, so that, even if reduction could be effected at an early age, it may be mechanically impossible by manipulation later on in life. From this it follows that, if Lorenz's method is to be adopted, it should always be done as early as possible after the child has become sufficiently clean to allow the necessary plaster bandages to be worn.

"Another drawback that must have struck those who have had much practice with the 'bloodless method' is the difficulty of being sure when the head of the bone is in the acetabulum. This point does not seem to have attracted the attention it deserves, for the difficulty is a very real one, even in experienced hands. It is true that the head of the bone gives a loud click as it passes over the posterior rim of the cavity, but it is easy, as I have repeatedly proved when performing the open operation, to obtain both the loud characteristic click and the stable limb without the head of the bone being in the acetabulum at all; what happens, at any rate in some cases, is that the head rides forward over the posterior acetabular rim, and then jumps to a position above and behind the joint where it is held in an apparently stable position by the extreme abduction that is being practised at the same time. In other cases there is already a shallow ridge of bone thrown out to bound the new acetabulum, and it is this that the head of the femur jumps, and it is into the newly-formed false joint that the head is reduced, being held in a stable position by jamming it against the ilium by the extreme abduction. This also I have actually verified more than once upon the operating table.

"Hallopeau presented to the Anatomical Society of Paris the dissection of the left hip of a child 2½ years old, who died of bronchopneumonia thirteen days after an attempt to reduce a congenital dislocation by the 'bloodless method,' and he sums up his observations by saying 'It would therefore have been quite useless to expect a bony point of support from the bloodless reduction of this dislocation.'

"It is common experience that great improvement follows the open or the bloodless method in the majority of cases provided that the patient is of a suitable age. The question of the durability of the improvement, however, or, in other words whether a false joint formed as a result of the operation is permanently stable or not, is one upon which little reliable information is at present forthcoming. The reason for this is that in the first place the operation—bloodless or open—has hardly been practised long enough to allow of its ultimate results being accurately gauged, and, moreover, attention is chiefly devoted to the 'cures,' while, in the second place, patients are very apt to pass from the surgeon's notice after a time; it is hardly likely that they would keep themselves under observation from early childhood to adult life, as is necessary if the true permanence of the 'improvement' is to be tested. It is a point to which particular attention must be directed in the future.

"And now, having pointed out the anatomical difficulties that lie in the path of true success with the 'bloodless method,' let me turn to the 'cures' claimed for it by those who practise it. Here we meet with a most extraordinary discrepancy in results and some considerable vagueness in language. Thus, Lorenz says that half of his cases are unsatisfactory from the anatomical point of view, and are to a certain extent failures. This he attributes chiefly to alterations in the neck of the femur, rendering it impossible to get the head of the bone in place without putting the limb in a position incompatible with ability to walk. He says, however, that even these cases are much improved by the new and stable joint. As to the anatomical cures, he remarks: 'In many cases the acetabular cavity enlarges and deepens concentrically, so that we can look upon it as a true anatomical restoration of the joint. In the majority, however, the acetabulum enlarges eccentrically by a new formation of bone along its upper border, beneath which the head of the bone remains firmly applied.' These latter cases clearly fall into the second group outlined above, and of course cannot be looked upon as true anatomical cures.

"As to the question of the relative safety of the various methods. It is true that Hoffa, in giving the results of his experience of the Hoffa-Lorenz operative method, says that he had 7 deaths in 248 cases directly traceable to the operation. These, however, were all from faulty asepsis in the earlier cases, and in the last 132 cases there has been no death. Indeed, the question of risk from the open operation that I have described above may be dismissed as trivial. The operation is easy; there is no shock even in the youngest subjects; the operation is practically bloodless, and occupies only a short time. On the other hand the list of accidents that may be laid to the credit of the 'blood-

less method' is a large one, although no fatality has occurred in connection with it as far as I know. Thus there may be severe shock; the femur may be fractured at either end or in the shaft; a very large hematoma may require incision and drainage; edema of the limb may occur, or severe lymphangitis; the sciatic nerve has been known to have been permanently paralyzed. Thus the 'bloodless method' is by no means free from risks, even in very skilled hands, and I venture therefore to suggest that at any rate it should not be advocated to the exclusion of other and more precise methods.

"My own' practice is to make a careful trial of Lorenz's method, in the first instance, in all cases under five years of age, and to check the results by radiography. If this does not show a true anatomical cure, I proceed to open the joint and deal with the dislocation in the manner already described; and so convinced am I of the freedom from danger that I do not hesitate to reopen the wound and reduce the dislocation afresh should it be found during the course of treatment that the head of the bone has escaped from the acetabulum; I have done this on two occasions with perfectly satisfactory results. Occasionally I try the Lorenz manipulations a second time if the patient be quite young—say under three years of age—and if the joint be quite mobile and with little shortening, as these cases are most suited for Lorenz's method. When, however, the child is near five years of age, and one careful attempt has failed, I do not waste time further, but open the joint at once. When the child is over five the chances of success by manipulation are much less, and I rarely spend much time over it. The manipulations are used here more as a preliminary to operative interference, and I would advise that, unless the head of the bone clearly goes into the acetabulum during them, time should not be consumed in an attempt that is almost certain to be futile, but that the open operation should be performed in a week's time.

"Bilateral cases are admittedly difficult to treat by manipulation. I believe that much time will be saved and much more good will be done by performing an open operation upon both sides at an interval of, say, three months.

"My own results I may summarize as follows: Lorenz's 'bloodless method' I have tried in 30 cases; in only one of them was a perfect cure obtained, and this case was a child under three years of age. In the remaining 29 some were submitted later to an operation, but all of those who for any reason were not, were very much improved as to gait and general usefulness, two or three of them being so much improved that they would, in the absence of radiography, have easily passed for cured. The only accident that has occurred to me in performing this method was a partial separation—or rather, a mere loosening, for the radiograph showed no separation—of the lower epiphysis of the femur in one case. This did not interfere at all with the progress of the treatment. I have performed the open operation that I have already described in 13 cases. In 9 the cure has been perfect, and the children are now walking about quite well; in 3 the head of the bone has escaped and has formed a new acetabulum above and behind the old, but the joints are quite stable—in other words, these are transpositions; 1 case is still under treatment; and in no case has there been complete failure. I do not therefore recommend the open operation as an infallible cure for these cases; but as a method that is safe and at the same time more likely to produce a precise result than mere manipulations. At the worst, if it fails to cure, it gives a result as good as the latter.

"The following conclusions are drawn from the foregoing considerations: (1) That all cases should be checked by radiography, and that no 'cure' should be spoken of that is not a true anatomical cure. (2) That all cases of congenital dislocation under fourteen years of age should be submitted to treatment. In the great majority improvement will result, while in some a true anatomical cure is brought about. (3) That in all these cases Lorenz's manipulations should be tried in the first instance. Even should they fail to effect reduction they facilitate any subsequent procedures. (4) That the prospect of a cure by Lorenz's 'bloodless method' is in direct proportion to the youth of the child, and that after the age of four years there is little hope of a true cure by its means. (5) That in any case the chances of a true cure by the 'bloodless method' are not very great. (6) That an open operation should be done whenever a radiograph shows that the 'bloodless method' has failed to reduce the dislocation, except perhaps in the case of a very young child—under three years—in whom the manipulations may be repeated. (7) That with the open operation no fear need be entertained of shock, bleeding, or sepsis. (8) That under no circumstances should the joint surfaces be remodeled. (9) That an open operation is more calculated to result in a cure as it enables the surgeon to ascertain beyond a doubt when the head of the bone is really in the acetabulum. (10) That the open operation is especially suited for cases over four years of age and for those of bilateral dislocation. (11) That after the operation the limb should be put up in the position of maximum stability; in the majority of cases this will be similar to Lorenz's position. The limb should be put up in plaster-of-Paris immediately and the casing should take in the flexed knee; this is essential in order to ensure stability of the head of the bone. (12) That all tense structures should be stretched or tenotomized as a preliminary measure a week or so previously to the open operation. The after-treatment is practically identical with that of the Lorenz method."

Mr. Noble Smith showed radiographs of 4 cases, one double in a girl aged six years, one single in a girl aged 11½ years, one single in a girl aged twelve years, and another single in a young lady aged 17½ years. These cases had been operated upon by Lorenz's method since he had seen Professor Lorenz operate in this country. In all these cases a fairly good result had up to this time been attained, although we had still to wait to see what the ultimate results would be. As regards the comparative value of the two forms of operation, he (Mr. Noble Smith) held an open mind, and so long as he could obtain good results, as in the cases shown, he would be content to depend upon operation without opening the joint. In this respect he was in accord with Mr. Burghard. He felt personally much indebted to Dr. Lorenz, because since seeing him operate he found he had succeeded far more satisfactorily than he had done when depending upon Lorenz's written description. He had operated on other cases but these four were the only ones in which he had obtained radiographs of the conditions before and after operation. He had said that the results were fairly satisfactory, but he must add the words considering the ages of the patients. In the six-year-old child the period of six months had elapsed, and he had removed the splint, and had found the joints working quite well, but still held in a very flexed and abducted position; this partial fixation was doubtless beneficial as regards the ultimate perfection of the joints. In the child aged 11½ years the position was very good, but it appeared from the radiograph that the head of the femur had

become detached; he did not think that this would prevent a good result. In the twelve-year-old child a perfect position appeared to have been attained. In the girl of 17½ years he had preceded the operation by many months of stretching and extending the joint. He had succeeded even in this case in placing the head of the femur in a natural position, but there had been a great tendency for the head to slip backward, and the radiograph showed that the head was behind the acetabulum, but at the same time there was no tendency for that head of bone to pass upward. He thought he had succeeded since then in replacing the head perfectly. Mr. Noble Smith also referred to another case of double displacement in a six-year-old girl, in whom he had no difficulty in reducing one joint, but on the other side he had not been able to obtain a perfect result, because the head of the femur could not be placed sufficiently forward. However, he thought that practically even under such circumstances a good result might be anticipated.

Mr. R. C. Dun said: "My experience of Lorenz's bloodless method has been limited to 4 cases. The first of these was reduced, some two months before Professor Lorenz's visit to this country, and the position obtained was not completely satisfactory. I learned much in watching Lorenz himself, and studying his methods of manipulation and subsequent fixation—particularly did I learn the importance of thorough stretching of the anterior part of the capsule of the joint after the reposition of the head. It is, of course, too early to say what the ultimate result in these cases may be. Undoubtedly improvement is generally evident when the child first begins to walk; it has yet to be proved whether such improvement is permanent. I have found that the employment of thin aluminium strips, incorporated with the plaster casing, materially diminishes its weight, and enables the patient to get about more readily."

Mr. Robert Jones said: "I believe that more than one way exists for the cure of congenital hip, and that the same method will not suit all. More good will come from a study of the causes of failure than from the most carefully compiled statistics. For years we have tried methods which have yielded an occasional success, such as extension and abduction in abduction frame, osteotomy of the neck to correct antiversion, manipulations for reductions, and various forms of operation procedure. Neither the Hoffa nor the Lorenz modification appeals to me, as stripping a joint of its cartilage and whittling the head of the femur directly makes for an anchylosing arthrodesis. The essential difference between the methods of Paci and Lorenz is in the recognition by Lorenz of the rudimentary character of the acetabulum and the necessity of enlarging it by direct pressure of bone. In support of the probability of this occurring I may mention that in a boy aged seventeen years, in whom I exsected the head of the femur for a traumatic dislocation, I found an excellent attempt at the formation of a joint. Until the visit of Lorenz I had no idea of the thoroughness of his manipulations, and I at once saw why so many failures had occurred in this country. Since his visit I have operated on 38 cases, 34 of which were reduced, as confirmed by palpation and X-ray photographs. In 4 cases the neck of the femur was fractured, and the shafts transposed anteriorly. These were only complications, and with an increase of experience I think they should not occur. The causes of failure in reduction were folds of capsule between the acetabulum and femoral head, sometimes constriction of the capsule, the importance of which was overrated, anteversion of the neck, and instability of the articulation, due either to a faulty head or rudimentary acetabulum. Of immense clinical importance is the question, 'Can these defects be recognized clinically?' In reply, I think that on completion of reduction one can prognose whether it will be permanent or not. If the hip in the act of being reduced gives the sensation experienced in the reduction of a traumatic case, and if there is stability after reduction, the prospects are good, and the prospects are moderate in those cases where reduction becomes stable after stretching the anterior portion of the capsule by prolonged extension of the abducted hip. Failure may safely be prognosed when the femur slips out of joint on the slightest provocation. In this last variety, exploratory incision is called for to correct soft structure obstruction, or to correct anteversion of the femoral neck. Anteversion can be diagnosed by radiography, as well as by palpation. If operation is done I strongly advocate incision after the dislocation is reduced, and if anteversion exists, the performance of osteotomy of the shaft of the femur, the neck being held in position by pins as recommended by Schede and Bradford. The statistics of the open and bloodless methods are in the hands of the two greatest authorities, Lorenz and Hoffa, about 50 per cent. of cures. This is sufficient proof that there is considerable overlapping, and that the majority of cases operated upon by Hoffa would be simply manipulated by Lorenz. I agree with Mr. Burghard that it is best not to denude the cartilage, but in the worst cases, where operation is most called for on account of anatomical misfits, how is the head to be retained short of excavation? In view of the diverse opinions, I intend to persevere with the Lorenz method as a routine, operating only in the exceptional case, and after a sufficient lapse of time shall form my own conclusions with regard to final results."

Mr. A. H. Tubby said: "With reference to the method of forcible reduction, according to Lorenz's method, we have not at present any means by which we can be quite sure that when the head of the femur appears to have been reduced into its proper place there is no infolding of the capsule or interposition of the capsule between the bones owing to the action of the tense iliopsoas. In fact it seems to me that the data on which an estimation of the condition of the parts may be made, both before and after reduction, are somewhat vague. Neither tactile examination nor the use of the X-rays can be relied upon to tell us exactly what the true state of affairs is. I have not had the opportunity of seeing Lorenz operate, but I am far from being satisfied that an entirely successful method of treatment has been found, even for young children. The risks are not inconsiderable. Fractures of the thigh, tearing of the sciatic nerve, rupture of the femoral artery, and gangrene and death have occurred. In fact it seems to me that the risks of this forcible procedure are as great if not greater than those appertaining to the open method, which may be summed up by the word 'sepsis.' Doubtless while each case should be treated on its merits, it is well, as far as possible, for every surgeon to adopt a line of treatment which promises to him the best results. I have been successful, so far as the certain reduction of the dislocation is concerned in recent cases, by first exsecting a portion of the adductor muscles, and of the sartorius and tensor vaginæ femoris, and then placing the limb or limbs in full abduction and extension for six weeks. Then the joint was opened by the anterior method and the resistant parts of the capsule divided, and by manipulation the head was reduced. The incision in the capsule was closed by suture, and the edges of the skin wound brought together and the limb placed in full abduction and retained there in plaster-of-Paris. I intend to treat

a number of suitable cases in this way, and shall be happy to report on them in three years' time. Indeed, I feel that such a course is imperative in the present condition of treatment of congenital displacement of the hip."

Mr. Burghard, in closing, thanked the speakers for giving their valuable personal experience. He regretted that the subject had been brought up so soon after the visit of Professor Lorenz had attracted special attention to the matter, so that sufficient time had scarcely elapsed for much reliable information to have been gained. He trusted that in a few years' time there would be another opportunity of contrasting the later results of the various methods of treatment. What was wanted for the true elucidation of this very difficult question was not an advocacy of one method to the exclusion of all others, but a series of cases by careful observers who were not concerned to advocate the method, but to state the facts. The question as to the permanence of the results must be the point to which attention should be directed most particularly in the immediate future. He still held strongly to the view that no one method was likely to succeed in all cases.

Splenomegaly in Infants and Young Children.—Dr. George Carpenter said that enlargement of the spleen is not an uncommon manifestation in early childhood, and it is frequently found enlarged in infancy. The clinical material which has passed through his hands during the last few years at the Evelina and the North-Eastern Hospitals for Children comprises 348 cases in whom the spleen was enlarged, as determined by palpation, from all causes during the first twelve years of life, cases such as are commonly found in out-patient hospital practice, and which have not been selected.

Dr. Edmund Cautley asked what Dr. Carpenter meant by splenomegaly. Did he include all cases in which the spleen could be felt? It certainly seemed so, judging by the fact that such a large number of cases had come under Dr. Carpenter's notice, and that no less than 163 were infants under one year of age, and as many as 320 out of the total of 348 were infants under eighteen months of age. Dr. Cautley suggested that the spleen was so easily felt in infants under six months on account of anatomical peculiarities, and in infants from six to eighteen months on account of rachitic deformity, that it might readily be supposed to be enlarged. He noted, also, that of the 57 cases associated with syphilis, 31 were infants under three months of age, and that of 60 associated with chronic snuffles, 32 were infants under six months. He thought that undue weight was laid on snuffles in out-patient practice as a sign of syphilis, and he regarded craniotabes as rarely due to syphilis, and commonly caused by errors in diet. In his experience the craniotabes described by Elsässer was very rare. It did not follow that a spleen, felt as enlarged in an infant, was of serious import from a diagnostic or prognostic point of view.

On the Utilization of Infants' Milk Dépôts.—Dr. T. D. Lister said: "This question involves a matter of direct interest to those who have to practise among the children for whom the dépôts are primarily intended. Those who have to treat the children of very poor and very ignorant parents, or the children of mothers whose employment necessitates a certain amount of child neglect, have to face continually certain difficulties which infants' milk dépôts are designed to overcome. For the wealthier classes no such difficulties exist.

"When the mother is able and willing to feed her child herself, these difficulties of treatment are minimized, for natural feeding and maternal care are the normal preventives of infantile mortality. But it is impossible to be blind to the fact that hand-fed infants form an increasing proportion of the whole infant population. The chief difficulties met with in feeding such children among the poor arise from bad milk supply, ignorance, and lack of facilities for the proper preparation of food. Broadly speaking, as we all know, they are associated with the use of improper bottles, contaminated milk (contamination occurring both in transit and at home), and milk substitutes.

"We are, as a profession, agreed that cow's milk forms the only practicable basis for hand feeding, that it should be pure and fresh and not overtreated either chemically or by cooking, and that the simpler the bottle and teat the better. I do not know what method of meeting these requirements on a large scale can be devised better than this system of infants' milk dépôts. It is recognized by public health authorities that such a system eliminates the many dangers arising from contamination by carelessness either in transit or at home, both of which—and especially the latter—have been proved to be fertile causes of infant mortality, and that it prevents the use of the many abominable milk substitutes that one constantly sees in the infants' dietary. Moreover, it has always been successful in those towns in this country where it has been tried, and there is a very large experience of its success abroad.

"No system of diminished impurity of the fresh milk supply will get over the difficulties of home contamination and carelessness, and those arising from the use of milk substitutes and impoverished milks among a certain class. The system of "certified milk" proposed by Dr. Coutts is very desirable so far as the ordinary milk supply for infant feeding is concerned, but it does not meet the special needs of those among whom infantile mortality from bad hand feeding reaches its highest point.

"It has been pointed out, notably by Dr. Peyroux, that there is a danger of the encouragement of hand feeding at the cost of maternal responsibility under the usual conditions of management of such dépôts. What I wish therefore to bring before you is that it is our duty to lend all our influence and assistance in counteracting this as well as other dangers in the use of milk dépôts. To say that any system of hand-feeding of children, whether "percentage" and other scientific methods, or the simpler methods used in milk dépôts, is as good as natural feeding is to be a contributory to child slaughter. Professor Rotch, who is probably the best living authority on the cow's milk feeding of children, said that no method yet devised was equal to that of Nature.

"Other objections have been raised from time to time to the establishment of infants' milk dépôts, as, for instance, that the method of feeding is not an ideal one. I do not think we need worry about that when the most scientific methods are said by their authors not to satisfy this condition. Infantile mortality among hand-fed children, so far as it may be diminished by careful feeding, is the matter requiring our immediate attention.

"How is this medical supervision of the infants to be secured without affecting the control of the dépôt by the health authorities, and how are we to secure milk dépôts where they are most wanted? To secure effective results they must be placed where they are wanted, and they must be used where they are placed. It is obviously only by the cooperation of the various interests that these results can be achieved, and it is for this cooperation that I think we should work.

"With these pledges of support from institutions dealing with a very large number of necessitous infants the success of a dépôt in their immediate neighborhood is already assured, and the borough council has decided

in favor of the establishment of a dépôt. As I have said, it does not matter to us as a profession where the funds come from to furnish the dépôts. That is a matter for local opinion. There is no doubt that the action of the Local Government Board auditors in disallowing the expenses of the Battersea milk dépôt will soon lead to a clear decision as to the powers of district councils in this matter, but where the district council does not care to undertake the work itself there is no reason why, having once obtained the support of the medical profession in the district, it should not afford information and facilities to charitable bodies on the one hand, or contractors on the other hand to enable them to carry out this necessary work in the districts where it will be most useful. As a mere matter of personal opinion I believe this to be so important a branch of preventive medicine that, properly guarded against abuse by the cooperation of medical practitioners, it should be undertaken by the municipal authorities. That such dépôts would be also of great advantage to us as practitioners in securing a definite method of feeding infants under one year of age carefully and exactly is undeniable in relation to the class for whom we want it. Moreover, their educational influence as to the care required in feeding children would not be the least of their advantages. Example is better than precept, and I anticipate better results from the milk dépôt than from the feeding leaflet.

"All I can claim for the suggestion is that such a method of cooperation would largely remove the objections that have been raised to the establishment and use of infants' dépôts by showing that the infants fed in them were under medical supervision, and that they were believed to be necessary and useful by the medical men in the districts where similar resolutions to those I have mentioned are adopted. It is a confusion of interests which prevents this work being done, and it is a coordination of interests which seems to me, as far as medical interests alone are concerned, likely to help toward its accomplishment."

Dr. Edmund Cautley, in discussing Dr. Lister's paper, said that the question raised by Dr. Lister was of both economic and political importance. He objected to the scheme on the ground that it tended to pauperize the poor, to render them less likely to carry out their proper duties to their children, and because there could be no guarantee that the particular milk would suit the particular child. To carry out the scheme efficiently would require a resident medical officer at the dépôt, constant modification of the food, and systematic weighing of the infants. Even if the scheme were a success, he feared it would then lead to an increase in the neglect of suckling, and ultimately prove injurious. It was by no means accepted as an axiom by experts in this country that percentage feeding was the best system for the artificial feeding of infants. He thought it quite the wrong way of attacking the question of infant feeding among the poor. The mothers should be taught, and, in his own experience, they would learn, if they wished to rear their children. If they did not, the scheme proposed would have little or no effect. The most that municipal authorities should do was, in his opinion, to secure a proper supervision of the milk supply, and to provide a clean good milk, which could be obtained by the very poor on a written order from a medical man.

Discussion on Tuberculosis in Children: Its Relation to Bovine Tuberculosis.—Dr. Nathan Raw said: "The relation of tubercle bacillus to the many and varied diseases which attack children is not yet thoroughly understood, but I am inclined to think it plays a much more prominent part than we are disposed to believe. What concerns me most in the study of this most difficult problem is, To what extent are these tuberculous lesions produced by cow's milk?

"Professor Koch, the greatest authority on tuberculosis, holds the view that human and bovine tuberculosis are separate and disinct diseases, and that bovine tuberculosis could not be conveyed to the human.

"With the latter part of this statement, I beg in all humility to differ from Professor Koch, and I will endeavor to lay before you my reasons for believing that bovine tuberculosis is frequently conveyed to children by means of milk, and is the cause of a considerable mortality.

"Now it must be admitted that the great body of experimental evidence is in favor of Koch's first contention that the two diseases are distinct, and that it is almost impossible to produce a general tuberculous infection in cattle by inoculating them with human bacilli from sputum. But it does not necessarily follow that because human bacilli have a low virulence for cattle that therefore bovine bacilli have only a slight pathogenic power for man, especially when we consider that bovine bacilli are not only virulent for cattle, but for various other animals, such as the rabbit, horse, dog, pig, and sheep. It therefore appears reasonable to suppose they would be virulent to man, since it is a fact that 'all the disease-producing bacteria that are common to all the domesticated animals are also pathogenic to man' (McFadyean). In short, Koch argues that bovine tuberculosis, being a distinct disease from human tuberculosis, cannot produce the human variety in the body.

"With this view I agree, but I am of opinion that man is attacked by two distinct varieties of tubercle, one conveyed by infection from one person to another, the other by receiving into the body bovine bacilli in milk or meat.

Two Varieties of Tubercle.—"During the last few years I have had under observation over 2,000 cases of phthisis pulmonalis, and I have been particularly impressed with the fact that the tuberculous process is nearly always confined strictly to the lungs. The patient usually gives a history, first of cough, then of expectoration; the disease often progresses to death, and the necropsy reveals destructive lesions of the lungs, and nothing more. Out of these cases of phthisis pulmonalis I have only seen the glands and the joints affected in 8 cases, and in the late stages one sees the intestine and peritoneum involved. Phthisis pulmonalis is essentially a disease of young adult life. It is rare to see it as a primary affection under the age of twelve years, the great majority of deaths taking place between the ages of thirty and forty years. On the other hand, strumous or tuberculous joints, enlarged glands, spinal disease, and abdominal tuberculosis with tabes mesenterica, are essentially diseases of infancy and childhood, and are only rarely seen in adult life. I have given particular attention to the clinical manifestations of these various tuberculous affections, and it is rare to see a patient with enlarged glands, strumous joints, or spinal disease develop true phthisis pulmonalis. In fact, clinically they appear to be antagonistic to each other, attacking the body at quite different periods of life, and exhibiting generally opposite symptoms. There are at the present time 118 cases of phthisis pulmonalis in the hospital, and in no case is there any other gross tuberculous lesion present which would certainly be the case if they were all caused by one identical bacillus which would be free to be conveyed all over the body.

"Again, I have had the opportunity of seeing over 500 necropsies on cases of tuberculosis, and I have noticed that even the lungs are attacked by two distinct va-

rieties of tuberculosis—one of a slow and insidious nature, the other rapid and acute, and generally associated with tubercle in other parts of the body. If one compares the appearances seen in cattle dying with tuberculosis with those of children dying of tabes mesenterica and abdominal tubercle, the almost exact counterpart is seen; in fact, as Creighton observes, there is an exact mimicry of disease.

"From these general clinical and pathological observations I am inclined to think that primary intestinal tuberculosis, tabes mesenterica, and other tuberculous affections of the serous membranes in children are probably bovine tuberculosis conveyed by milk, and are not related to human tuberculosis, although the bacillus of Koch is found in them all, and is indistinguishable.

Tabes Mesenterica.—"Now let us take first of all tabes mesenterica. By this disease we mean what is popularly called 'consumption of the bowels,' and is one of the most common forms of abdominal tuberculosis in children.

"Infants and children suffer from tuberculosis of the intestines and glands, but it is perhaps more common before the age of two years than afterward. In 103 consecutive necropsies of children dying of tuberculosis at the Manchester Children's Hospital, there was tuberculous ulceration of the intestine in 62, cheesy mesenteric glands in 71, and both ulcers and cheesy glands in 55, tuberculous glands without ulcers of intestine in 7. Ashby states that in at least 70 per cent. of children dying of tuberculous disease of the mesenteric glands was present, and in rather more than 55 per cent. tuberculous ulceration was associated with it, and, he wisely says, primary tuberculosis of the intestine is suggestive of infection by means of tubercle bacilli taken in milk from a tuberculous cow. The figures at the Great Ormond Street Children's Hospital, London, are as follows: In 254 tuberculous children examined post mortem, 151, or 59 per cent., showed cheesy mesenteric glands, and Dr. Still found that in 29 per cent. of cases of tuberculosis in children, primary infection had taken place through the intestine. Woodhead records 127 cases of fatal tuberculosis in children, with involvement of the mesenteric glands in 100.

"My own experience of this affection coincides with these figures, and of 273 cases which I have diagnosed clinically as tabes mesenterica, only 38 have come to post mortem.

"I grant it is extremely difficult to exactly diagnose the onset of tabes mesenterica, and it is not to be assumed that a great many of the cases of diarrhea, wasting, and general inanition in children are tuberculous, as they certainly are not; but I believe that tabes mesenterica is a great deal more common than is generally supposed, and, what is more, a great number of children who receive a mild infection, which is confined to the mesenteric glands, recover absolutely. I have seen this frequently in the hospital, where enlarged palpable mesenteric glands have slowly subsided, and under proper treatment the child has quite recovered. In 5 cases in which I have opened the abdomen during life for hernia and other abdominal disorders I have seen the mesenteric glands much enlarged and apparently cheesy, with sometimes nodules on the peritoneum, yet these children were not suspected of being tuberculous, and they all left the hospital well. Many other surgeons and physicians will be able to confirm this point. Assuming these mesenteric glands to be tuberculous, the question arises, How do the tubercle bacilli find their entrance?

"This difficult problem cannot be proved like an ordinary scientific experiment, since it is impossible to inoculate the human being, and I sincerely hope it will never be attempted. But by carefully considering all the known facts bearing on the question, we ought to be able to find an answer which in all human probability will be approximately accurate.

Tabes Mesenterica and Milk.—"I claim your indulgence when I attempt to lay before you all the evidence which I can in support of my view that tabes mesenterica is caused by bovine tubercle bacilli in milk.

"If we consider for a moment the remarkable diminution in human phthisis during the last fifty years, amounting to over 45 per cent., we would naturally expect that other forms of tuberculosis would have fallen in the same ratio were they all caused by the same bacillus. But this is not so; on the contrary, the death rate from abdominal tuberculosis in children as shown by Sir Richard Thorne-Thorne, has greatly increased, amounting to over 20 per cent., and, what is more significant, tuberculosis in English cattle is rapidly increasing.

"Veterinary authorities, such as Nocard, Bang, Dollar, and McFadyean, agree that about 20 per cent. of dairy cattle suffer from tuberculosis, and recent official figures from different parts of England show that in London dairies 25 per cent., in Edinburgh 40 per cent., Midlothian 23 per cent., Durham 19 per cent., and Yorkshire 25 per cent. of the cows are tuberculous.

"If, however, every tuberculous cow produced milk containing living tubercle bacilli, the whole community would be in danger; but it is now generally admitted by experts that only cows wth a tuberculous affection of the udder are really dangerous, and the percentage of such cases is very small, only amounting to 2 or 3 per cent. I have made most careful inquiries during the last five years, and I have never seen a case of tabes mesenterica which had not been fed for some weeks or months on cow's milk. This I consider a most significant fact.

"With a view to excluding infection from parents or family at home I have made a most careful inquiry on this point, and of the 34 deaths only one child had a phthisical parent, so that the probability of infection in this direction is extremely small.

"Now, it is argued by some observers that the tubercle bacilli are not primarily introduced into the body through the mesenteric glands, but that these become affected later on from some other part. If this is so, I ask, How is it that adults suffering from phthisis do not become affected in the mesenteric glands in the same way? It is a fact that they rarely do so, and it is very unusual to see the mesenteric glands affected in phthisis pulmonalis, except as a late affection following secondary intestinal ulceration.

Similarity of Bovine and Abdominal Tuberculosis in Children.—"The next link in the chain is the clinical history of a case of tabes mesenterica. In a Poor-law infirmary we often see the child from the commencement of the illness—chronic intestinal catarrh, with diarrhea of offensive yellow stools, with perhaps streaks of blood, a general wasting, and distention of the abdomen. I have examined very carefully several such cases, and have invariably found the chest quite healthy in the early stages of the illness. As the disease slowly progresses, and the atrophy and wasting consequent on the diseased mesenteric glands continues, the general tuberculous symptoms are more pronounced, the temperature becomes hectic, the child begins to cough, and on examination the lungs are found to be tuberculous, and the child invariably dies. The point I wish to make is this: The infection commences in the mesenteric glands from the intestine, slowly spreads to the retroperitoneal glands, then through the diaphragm to the glands in the posterior mediastinum, and finally to the lungs. If the child

lives long enough the brain may be affected too. At the necropsy this process has been corroborated again and again, and I have a case where there was extensive caseation of the mesenteric, retroperitoneal, and portal glands, and only a few grey tubercles at the base of both lungs.

"In nine cases the lungs have not been attacked at all, the disease being confined to the abdomen. If we compare the course of this infection with that seen in the calf which is fed on tuberculous milk, we see an exact mimicry of the disease in every detail. The direction of the lymph stream would certainly be strongly in favor of infection from the intestine to the thoracic organs.

"Passing from the clinical to the bacteriological side of the question, we know that if the various tuberculous lesions in the body are carefully examined the bacillus of Koch is usually found, and, in my opinion, this has led to error in assuming that we were dealing with one bacillus. Koch has shown, I think conclusively, that human and bovine tuberculosis are distinct diseases, but the bacillus of both is morphologically identical and cannot be distinguished under the microscope.

Probable Non-identity of the Bacilli.—"On the other hand, the cultures of the two diseases are different, and Professor Ravenal, of Philadelphia, affirms that 'the tubercle bacillus from bovine sources has in culture fairly constant and persistent peculiarities of growth and morphology by which it may tentatively be differentiated from that ordinarily found in man.'

"From a recent case of tabes mesenterica I made cultivations of the mesenteric gland on blood serum with glycerin, and to my surprise the growth exactly corresponded to bovine tuberculosis or Perlsucht. Again from a strumous knee-joint I made a cultivation from the interior fluids of the joint, with an exactly similar result.

"I also inoculated two young heifers with the tuberculous material from a case of advanced hip-joint disease and advanced disease of the knee-joint. They both got thin and wasted, and after four months were killed. At the necropsy there was found in each animal an extensive involvement of the mesenteric glands but no affection of the viscera. Tubercle bacilli were found in the glands of each heifer.

"The experiments recently reported in the British *Medical Journal* by MacFadyean and McConkey are most interesting, and show that active tubercle bacilli are present in a large number of cases not suspected of being tuberculous.

" 'The experiments have shown that in the non-tuberculous cases, virulent tubercle bacilli were present to the extent of 25 per cent. The tubercle bacilli, it appears from these experiments, are present much more frequently in the mesenteric glands than ordinary necropsies would lead one to suppose.' This evidence strongly supports the view that I have for a long time held: That a great many children receive a mild infection of mesenteric tuberculosis through cow's milk, and recover absolutely, the infection getting no further than the glands.

Tuberculous Peritonitis.—"We have all seen cases of tuberculous peritonitis completely recover after opening and draining the abdomen, and nothing more. So far no satisfactory explanation of this result has been given.

"My opinion is that it is a localized bovine tuberculosis which has died out, and that relief of the fluid is sufficient to cure the patient. Taking all these facts into consideration, I am of opinion that bovine tuberculosis is very virulent for children, and is accountable for tabes mesenterica and other varieties of abdominal tuberculosis; in fact, I believe it to be more virulent for children than human tuberculosis.

"In arriving at this conclusion I lay great stress on the fact that, out of nearly 300 cases of tabes mesenterica observed during the last twelve years, I have never known one to occur in a child which had been fed strictly on the breast, the whole of them, without exception, having been reared on cow's milk for some considerable period.

Scrofula.—"We all know now that scrofula, so-called, is nothing more or less than tuberculosis of the lymphatic glands, but is it human tuberculosis?

"I must confess to a difficulty in understanding how it is that these local tuberculous lesions such as enlarged glands in the neck, pulpy joints, and caries of the spine should generally develop in childhood, and in the majority of cases recover and never be heard of again. For it must be admitted that these cases rarely develop tuberculosis of the lung excepting in the process of a general infection.

Nature of Enlarged Cervical Glands.—"Out of over 2,000 cases of phthisis I have only seen enlarged cervical glands in 5, and although one occasionally—but very rarely—sees phthisis pulmonalis follow operation on these glands, it might be explained by direct extension of the deep cervical lymphatic glands to the apex of the lung. How many scores of strong, healthy, vigorous children and adults do we see who have suffered from tuberculous glands in the neck with never a symptom in after-life. Surely these people cannot be classed as tuberculous; they have suffered from a mild infection of tubercle bacilli, which was in all probability bovine in origin and absorbed from milk.

"I was particularly impressed when attached to the Dundee Royal Infirmary with the number of strong, healthy, vigorous children from the country districts in Forfarshire who were brought to the hospital suffering from enlarged glands and strumous joints. In many cases general constitutional treatment, with change of air—for change of air means change of cow—produces a cure, or, if necessary, remove the glands or diseased joint, and the child becomes fat, and makes a perfect recovery.

"The most reasonable theory is that scrofulous glands in the neck are produced by the absorption of tubercle bacilli in milk through the tonsils and pharynx, and is, as a rule, a purely local affection. This view is supported by feeding experiments on animals. If pigs are fed on tuberculous milk they invariably develop enlarged tuberculous glands of the neck and throat which on inoculation produce bovine tuberculosis in cattle, and tuberculous lymphatic glands from the human when injected into calves have produced a general tuberculous infection. This is strong presumptive evidence of their being bovine in origin.

"If this view is correct it would help to explain the occurrence of acute general tuberculosis occurring in those suffering from an unhealed focus, such as a gland, a strumous joint, or a psoas abscess, for we are all aware of the danger of operating on a caries of the spine, a tuberculous bone lesion, or removal of glands, lest a general blood infection should follow. If we observe closely this acute general tuberculosis we find it closely resembles that seen in cattle, affecting chiefly the serous membranes and the lungs, a condition which rarely accompanies phthisis pulmonalis.

Tuberculous Meningitis.—"It is often a matter of perplexity to the doctor to explain the onset in a previously healthy child of an attack of tuberculous meningitis. Sometimes it is confined to the brain, at others it is part of a general infection. Perhaps it is a bovine tuberculosis, as we have all seen necropsies where

there has been no other discoverable evidence of tubercle. There is also much evidence to suggest that acute miliary tuberculosis is also bovine in origin. I have mentioned a few points briefly with the object of having the opinions of others on this difficult and absorbing problem, and I conclude by expressing the opinion, based almost exclusively on clinical and pathological evidence, that human and bovine tuberculosis are distinct varieties of disease, as shown by Professor Koch, but that the human body is susceptible to both, and especially to bovine tuberculosis in the early periods of life.

"The two diseases are so rarely seen together in the human that there seems to be some ground for presuming that they are antagonistic to each other, and that bovine tuberculosis may possibly confer an immunity against human tuberculosis. If this opinion should prove correct, I venture to submit that it would reconcile the conflicting opinions which have been so frequently expressed during the last two years on this most terrible of all diseases."

W. Arbuthnot Lane said: "I should like to insist on the importance of recognizing that either local injury or disease predisposes to infection. The glandular enlargement, so often seen in children, is much too readily assumed to be tuberculous. Many other causes give rise to it."

Koch's Announcement.—Dr. Douglas A. Reid said: "Until the meeting of the British Congress on Tuberculosis in 1901 it was an accepted creed that bovine and human tuberculosis were one and the same disease and that it could be transmitted through meat and milk from cattle to the human subject.

"Then came the bomb-shell of Professor Koch, exploded with great suddenness and with far-reaching effect throughout the civilized, and particularly the medical, world. The eminent professor in starting a new creed used words that will be memorable throughout the ages. 'I should estimate the extent of infection by the milk and flesh of tuberculous cattle and the butter made of their milk as hardly greater than that of hereditary transmission and I therefore do not deem it advisable to take any measures against it.' Inasmuch as the theory of hereditary transmission has now been practically abandoned this must be read to mean that bovine tuberculosis cannot be transmitted to man. Dr. Nathan Raw has advanced a third creed, which somewhat adds to our difficulties in coming to a conclusion in the matter. If there is a 'variety of bovine tuberculosis that can be conveyed by milk from tuberculous cattle' then we are right, and the Government is right and the National Association is right in warning the public to avoid tuberculous meat and milk, and Professor Koch is wrong in advising a contrary procedure.

Tuberculosis Rare in India.—"But while experiments and investigations are going on, who can say positively where truth can be found? What has become of the French doctor who inoculated himself with bovine tubercle? It is not my intention to occupy your time with opinions of my own on this subject, but, by the courtesy of Dr. Crombie, I am enabled to contribute some facts and statistics connected with India that may be of value when we come to weigh the evidence for and against the different views that have been advanced. Dr. Crombie submitted a report to the Secretary of State for India on the Congress on Tuberculosis at Berlin in 1899, which was published in the report of the Sanitary Commissioner with the Government of India for that year. This publication is not easily available, and Dr. Crombie has very kindly obtained for me a copy of that part of his report bearing upon tuberculosis in India. It must be borne in mind that a large number of persons die in India without any medical attendance whatever, and therefore in some parts only of the country can statistics be obtained, and one part is in the Northwest Provinces. Here during the year 1897 the cause of death was verified in 15,116 cases by means of the medical staff and a professional agency which voluntarily supplied the required information. Of these 15,116 deaths, 40 only were from tubercle of the lung—6 children and 34 over the age of sixteen years. There were no deaths among children from tabes mesenterica or tuberculous meningitis. The 6 children who died were all under eighteen months. The experience of all medical men in India is that in contrast with that of Europe diseases of the chest, and phthisis among them, take quite a subordinate place in the sickness and mortality of India, and that the tuberculous diseases of children are exceedingly rare among the civil population. Dr. Crombie further reports: 'With regard to tuberculous diseases among children, all authorities are unanimous as to their rarity. Taking strumous enlargement of the cervical glands as the commonest and most obvious form of tuberculous infection in children, Chevers says that he never saw a case in a native of the plains of India.' And other authorities confirm this. Tuberculous meningitis is, however, met with in India, but less frequently than in Europe. Tabes mesenterica is certainly very rare among the civil population. Chevers says that he never admitted a case to hospital. Morehead does not mention it as occurring in the large Byculla schools at Bombay, neither do Webb and Fayrer as regards the Calcutta schools, and the contemporary accounts of the health of the children (mostly Indo-Britons) at the Madras orphan asylums are silent with regard to it. It was at one time, however, apparently very prevalent among the children of European soldiers serving in India. From 1880 to 1883 inclusive there were 162 admissions and 86 deaths from tabes mesenterica among European children in India, while only 3 prisoners and 5 native soldiers were so affected. In 1896 there were no cases in the native army or gaols of India.

"Tuberculous disease of the hip-joint is exceedingly rare. Dr. Crombie never saw a case, nor have any of the medical officers whom he has questioned. From the very interesting statistics in Dr. Crombie's report it is not clear that the great immunity of residents in India, both native and European, so conspicuous in childhood, is extended in an equal degree to adults, at least as regards the conditions under which our soldiers and prisoners live.

"The causes of lesser prevalence of tuberculosis in India are given by Dr. Crombie as follows: (1) The comparative infrequency of bovine tuberculosis in India. (2) The native habit of boiling all milk before using it. No native of India knowingly drinks a drop of unboiled milk. (3) The exclusion of beef from the food of a large proportion of the native population. To the Hindu it is an abomination. Stall-fed beef is unknown in India, even in the large towns. (4) The flesh of the goat is almost exclusively used by Mohammedans, that of the sheep by Europeans. The goat is one of the animals most 'refractory' to tuberculosis. Goat's milk is also much used by the natives. (5) The open-air occupation of the natives. (6) Abstinence from alcohol. (7) The native of India converts all his butter into "ghi" by a process of boiling and skimming, which must destroy any tubercle bacilli it may contain. The European in India eats raw butter. (8) Children in India have this additional advantage over European children (in India) that their mothers al-

most without exception suckle them until they are two or three years old. (9) The comparative infrequency of the diseases which seem most frequently to predispose to tuberculosis—namely, measles, scarlatina, and whooping-cough—which, when they do occur, are milder than in Europe (Ewart).

"The inference to be drawn from the preceding facts is that where the flesh and milk of bovine animals is not much used by the people, and especially where cow's milk, except in a boiled state, is not used for the feeding of children, tuberculous diseases are extremely rare, and that this affords evidence against Professor Koch's contention.

"On the other hand, we have to face the statement, which I suppose we must accept as a fact, that a very large number of milch cows are tuberculous and that the number so affected is increasing. As an increasing number of British mothers refuse to suckle their children we ought to find more tabes mesenterica and tuberculous peritonitis among the children. Dr. Raw says it is so, and this I was not certain about, having no reliable statistics to guide me."

Contamination of Milk in the Home.—Dr. John Mackenzie said: "I cannot accept that all the tuberculosis found in children is due to milk infection. The children of the poor are often breast-fed. The mothers believe that while they suckle their children they will not conceive again. The milk is kept in the homes of the poor under conditions that greatly encourage tuberculous infection, if it should be otherwise present in the house. Tuberculous meningitis I have often observed to be due to disease of the middle ear. The enlargement of cervical glands may be due to scarlet fever, diphtheria, and septic sore throat. Hence we must not rush to the conclusion that all large cervical glands are tuberculous."

Possibility of Primary Abdominal Infection.—Dr. Theodore Fisher said: "I think Dr. Nathan Raw takes too extreme a view. I do not, of course, deny the possibility of primary abdominal infection, or that such infection is sometimes of bovine origin, but that infection through the respiratory tract is far in excess of that through the alimentary tract my own experience seems to leave no shadow of doubt. Statistics may be quoted of the relative frequency of infection of the bronchial and mesenteric glands from Germany, France, and America, which present the matter in a different light from that given by Dr. Raw. In my experience the primary or only focus of infection is, in the great majority of instances, in the bronchial glands. Extension of infection from the mesenteric to the bronchial gland must be extremely rare. I can mention cases showing that tuberculosis peritonitis and other forms of acute or subacute tuberculosis of abdominal organs may occur where the only caseous focus is in a single bronchial gland hidden within one lung."

Dr. W. Langford Symes said: "I wish to ask Dr. Raw what he actually means by tabes mesenterica. Dr. Raw quotes 273 cases of tabes. There are three forms of abdominal tuberculosis usually seen—namely: (1) Tuberculous peritonitis, of two or three kinds; (2) tuberculous ulceration of the bowels; (3) tabes mesenterica where the glands alone are affected. This latter is in reality the rarest of all kinds, and the use of this term frequently gives rise to misunderstanding."

Double Infection.—Dr. Edmund Cautley said: "In one point I agree with Dr. Nathan Raw, namely, that probably the bovine bacillus gives rise to a different form of tuberculosis to that produced by the human bacillus, and that children are subject to both kinds of infection. I differ from him in regarding infection by the bovine bacillus as of comparatively rare occurrence. It is with the greatest regret that I hear Dr. Raw perpetuating that unfortunate name 'tabes mesenterica.' It has led to endless confusion, and, on the grounds of scientific precision, should be omitted from the nomenclature of the tuberculous affections. I am still more astonished to hear him quoting Sir Richard Thorne-Thorne's statistics of tabes mesenterica in support of his views. Time after time it has been pointed out that these statistics are absolutely valueless. They were taken from the Registrar-General's reports, and it is well known that in those reports all cases certified as deaths from 'consumptive bowels' are included under the heading of tabes mesenterica. This is absolutely misleading, for almost all cases so certified are nothing more nor less than cases of marasmus due to diarrhea and vomiting, from unsuitable feeding, and ending in death. I am not inclined to accept the statement of veterinary surgeons that about 30 per cent. of English cows are tuberculous. Such a statement may be true of highly-bred pedigree stock and of old milch cows kept under unsuitable conditions, and yet be absolutely inaccurate of younger cows kept in healthy country surroundings. Even accepting it as true, the result is probably based on the reaction to tuberculin, and does not indicate that the milk is likely to be infective. The fact that many children get a mild infection and recover is to my mind an argument of no value in favor of the views of Dr. Raw. The liability to infection by the human bacillus is enormous in the conditions under which the very poor live, and the milk may be infected by the human as readily as by the bovine bacillus. From the experience of a large hospital practice for many years I have derived the impression that tuberculous meningitis diminishes in frequency in proportion to the increased use of cow's milk in infant feeding. Certainly the proportion of such cases has very much decreased in my experience under such conditions. I regard condensed milk as a potent factor in the etiology of tuberculous affections, by lowering the vitality of the child, and rendering it more susceptible to infection by the human bacillus. As to infection via the alimentary tract in opposition to infection through the pulmonary system, I should like to quote the result of 27 necropsies on cases of tuberculous meningitis. In 25 instances the state of the mediastinal and mesenteric glands was noted, and in no less than 23 were one or more of the mediastinal glands caseous. In 4 out of these 23 the mesenteric glands were also caseous, but in none were they the only ones involved. On the whole, it seems to me that up to the present we have no justifiable grounds for concluding that tuberculous milk is a serious source of infection."

Primary Infection of Glands.—Dr. George Carpenter said: "Certain cases of tuberculosis are, in my opinion, primarily abdominal. If infection of the lungs takes place in these cases, it is probably secondary, and by way of the thoracic duct. Other channels of ingress are, however, much more usual avenues of infection. In a case of enteric fever with an intestinal ulcer and enlarged mesenteric glands, I found both tubercle and typhoid bacilli in the glands. This proves conclusively that primary infection of the glands can occur. Dr. Raw has not called attention to a well-known occurrence in these cases of a sound mucous membrane with advanced caseous disease of the mesenteric glands. I object to the loose term tabes mesenterica, a nomenclature which should be abandoned. I have in a large experience only seen two cases of glandular disease which could be fairly called tabes mesenterica. The common clinical state is a mixed condition of tuberculous peritonitis, tuberculous ulcers, and caseous mesenteric glands, which can be detected as fixed abdominal

lumps. I should like Dr. Raw to say what he really means to convey by the term tabes mesenterica. I think that many cases of dyspepsia in infants and young children are unwarrantably described as cases of tabes mesenterica. Are Dr. Raw's experiences clinical or pathological? I call attention to the importance of making a combined rectal and abdominal examination in doubtful cases. It is possible in this way to determine the presence of tuberculous peritonitis. Dr. Raw has spoken of abdominal section in these cases. I consider abdominal section unjustifiable, and all that is necessary in some cases of ascites when there is considerable distention by fluid is the simple operation of paracentesis abdominis, preferably by Southey's trocar and canula. Abdominal section should only be undertaken when there is pus in the abdomen or for the relief of intestinal obstruction. Dr. Raw has stated that he has never seen a case of abdominal tuberculosis which has not been fed on cow's milk. My experience is somewhat different, as I have met with two primary cases in breast-fed infants. In one of them the appearance was that of simple chronic peritonitis. The false membrane could be stripped off the intestines, leaving a polished surface, and it was not until a microscopical examination was made of this membrane that its tuberculous nature was recognized—it was crowded with tubercle bacilli."

Glandular Invasion Secondary to Trauma.— Mr. Adam Eccles said: "I wish to emphasize the remark which fell from the President that, from a surgical point of view, there seems to be much evidence that there is a lesion prior to the infection by the tubercle bacillus. I think that there might be direct infection through the blood stream, without involvement of the cervical glands, of both meninges and of joints. So many children suffer from lesions of the tonsils and nasopharynx that it would seem possible, even probable, that bacilli in milk may be arrested and imprisoned here, and become directly absorbed. In tuberculous peritonitis, if there is no secondary infection, recovery would seem to be the rule, and therefore the question of a primary tuberculosis of the abdomen is important from a point of view of prognosis."

Dr. Nathan Raw, in closing, thanked the members of the Section for their criticism of the points raised in the paper, and read a letter from Professor Madden (Cairo) supporting his view that children in Egypt were not often attacked with tuberculous glands or abdominal tubercle owing to the general custom in Egypt of suckling the children up to the age of two years. He was strongly of opinion that tubercle spread from the abdomen to the lungs in children a great deal more frequently than vice versa. He concluded by affirming the view that human and bovine tuberculosis were different species of tuberculosis, and that the child was more susceptible to bovine than human infection, and that the general mode of infection was by the ingestion of tuberculous cow's milk.

BOOK REVIEW.

FINDLEY'S GYNECOLOGICAL DIAGNOSIS. The Diagnosis of Diseases of Women. A Treatise for Students and Practitioners. By PALMER FINDLEY, M.D., Instructor in Obstetrics and Gynecology in Rush Medical College, in affiliation with the University of Chicago. In one octavo volume of 494 pages, richly illustrated with 210 engravings and 45 full-page plates in colors and monochrome. Cloth, $4.50, net; leather, $5.50, net. Lea Brothers & Co., Philadelphia and New York.

AT a time when prominent men are talking of the "passing of the specialty," and the cry is raised in some quarters that Gynecology has no more worlds to conquer, the appearance of a volume devoted exclusively to *gynecological diagnosis* is an evidence of faith, in at least some quarters, that gynecology still retains a goodly modicum of reserve force and staying qualities. This confidence is not misplaced. There is a future for the specialty as well as a lustrous past. It will consist in elaborating technic and in perfecting diagnosis. In the latter particular the book before us is a step in the right direction, and worthy of all commendation. If the author has made any mistake it is in the endeavor to cover too much ground, rather than elaborate to the last detail, and spend his time upon, conditions particularly difficult of diagnosis. The author's directions for digital examination of the internal genitals is a case in point, especially the combined or bimanual method. The method is extolled as "the most valuable of all physical explorations of the pelvis," and considerable time is expended in telling what can and what cannot be done, but it is doubtful if anyone, by reading this chapter, would gain much insight into how, practically, to apply the method. The picture on page 59, purporting to illustrate the method, is altogether faulty. The table is too high and the operator too far away from the patient. Working at arm's length and at so high a reach it is impossible to make efficient pressure either in the vagina or on the abdomen; it is no wonder that the list of things that cannot be done is long. The same criticism, in a general way, will apply to the chapter on displacements of the uterus. The illustrations of the conditions are clear and instructive, but the explicit directions for their detection are not so lucid.

As the author truly says: "The recognition of the pathology of the pelvic organs in large measure constitutes a diagnosis." Acting upon this principle he has incorporated a thorough discussion of the morbid anatomy, both macroscopic and microscopic, and added valuable suggestions on the clinical indications. Special stress has been laid upon the microscopic findings in the various lesions, emphasizing the fact that "without the microscope a diagnosis is not always possible."

The chapter on ectopic pregnancy elaborates the subject well; it is beautifully illustrated, is concise and clear. The diagnosis of pregnancy, especially in its early stages, and abortion, is most apropos. In Chapters XVIII and XIX may be found a very instructive discussion of that rare condition of hydatiform mole and chorio-epithelioma malignum, more commonly called deciduoma malignum. In the discussion of cancer of the uterus the author follows closely Cullen's masterful presentation of that subject. The chapter points out emphatically the importance of early diagnosis—prompt and thorough examination, both macroscopic and microscopic, in all cases presenting the least suspicion of malignant tendencies—and tells how to do it. The diagnosis and pathology of diseases of the ovaries are fully presented—this is one of the best chapters—and the book closes with a brief treatise on the urinary apparatus, the urethra, bladder, ureters, and kidneys.

The book, as a whole, is an agreeable résumé of what is presented in the various text-books on gynecology. There is nothing new presented and nothing impressive or remarkable in the manner of its presentation. But some valuable hints are dropped here and there; the index is full and complete, and altogether, the work affords a reliable and convenient reference book covering the entire field of gynecological diagnosis.

The volume has a most attractive appearance, is generously illustrated, and does credit to the publishing house from which it emanates.